amateur radio

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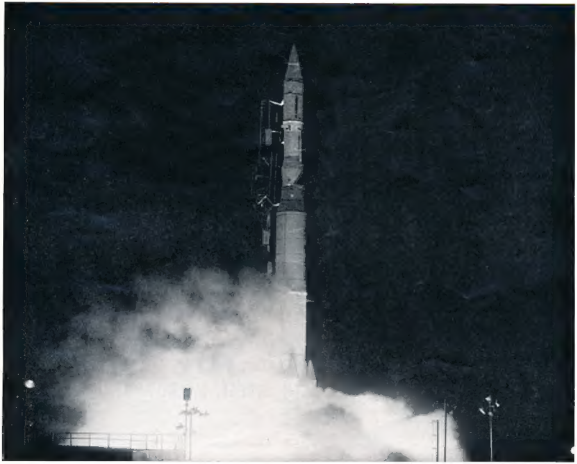

amateur radio

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COVER STORY

The launch of Delta 76 containing Australis Oscar 5 Satellite. See stories on pages 7 and 8 of this issue. The cover photograph and the two other photographs on pages 7 and 9 are by courtesy of NASA, U.S.A.

SIDEBAND ELECTRONICS ENGINEERING

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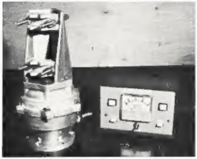

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FEDERAL COMMENT

1970-008B is the official designation, although it would be hard to find a less impressive title, for the Australis Oscar package launched on 23rd January, 1970.

Four years of planning, delays and frustration were of little consequence compared to the few weeks before the launch. "Go," "No," "Go" signals were the order of the day and taxed everyone's patience to the limits. Understandably, it came somewhat of an anti-climax to believe that on a warm Friday night in Melbourne that Australis Oscar 5 was in orbit, acquired, and as far as could be determined was functioning as planned.

Subsequent Amateur history may give scant reference to this event, but when it is realised that apart from being an Australian Amateur "first," the way has been opened for the Amateurs of this country to participate in future projects, more sophisticated, more expensive, but more versatile than was ever considered the case four years ago.

International recognition is a difficult thing to achieve in any sphere, but we would like to modestly believe that the Amateur Service in this country, with the launching of Australis Oscar 5 has "arrived". To have made this possible, tributes must be paid to the administrators of Project Australis: the vigour with which Richard Tonkin and Owen Mace followed the project to fruition is especially commendable. To everyone—designers, technicians, communicators, public relations people, the many organisations and Government departments that supported the project, and, of course, the AMSAT fellows themselves, we owe a special debt of gratitude.

Those who listened to the launch and subsequent events on the VK2 and VK3 Divisional Stations must have been impressed with the truly international flavour of the proceedings. Initiated by Chris. Jones, VK2ZDD, the broadcast provided all the drama of on-the-spot reporting necessary to add colour to the event. Our thanks again go to Chris Jones and Tim Mills for a fine job.

As this is written, Australis Oscar 5 is in its third week of successful operation, but all Amateurs whether as active participants or indulgent onlookers must take stock of the situation and be ready to assist in future packages.

We believe that this Institute and all Amateurs alike should be involved in these projects: the ability to design and construct has been amply demonstrated and it is of vital importance to retain the skills of those associated with the project and maintain the confidence of the AMSAT group in our future operations.

No one can predict with any degree of certainty the style of future Amateur Radio operations, but it is obvious that the expansion of all aspects of v.h.f.-u.h.f. techniques is going to play an ever increasing role in Amateur experimentation and communication. The Australis group must further develop these techniques and with this success under its belt it has the potential to design the next package in the series. Already preliminary work has been done on a multi-channel translator, but as with most things of sophistication, money will be needed to bring the aims to reality.

As said earlier, this Institute has faith in the project and its personnel—how we and you can assist will be on the agenda for the Federal Convention at Adelaide this year.

History, it is said, has a habit of repeating itself—we sincerely hope it does.

PETER D. WILLIAMS, VK3IZ,
Federal Secretary, W.I.A.

AUSTRALIS OSCAR 5 ORBITS THE EARTH

By RICHARD TONKIN*

The Australian-built Amateur Radio satellite, AUSTRALIS OSCAR 5 was successfully launched into space at 1131 GMT, 23rd January, 1970. The 39-lb. satellite piggy-backed into orbit on a NASA Delta rocket from the Western Test Range, California

THE launching marked the first time that an Australian-built Amateur satellite had been put into space and it ended a four-year "drought" in Amateur space launchings since the orbiting of OSCAR 4 in 1965.

AUSTRALIS OSCAR 5 went into an orbit very close to the planned one. The orbital parameters are:

Apogee	910 miles
Perigee	880 miles
Period	115.06 minutes
Inclination	101.9 degrees

Through the co-operation of the P.M.G., O.T.C. and the A.B.C., VK2AWI and VK3WI were able to broadcast a direct description of the launching which was relayed from the N.A.S.A. Goddard Space Flight Centre in Maryland. Amateurs and S.w.l's throughout Australia reported hearing the broadcasts.

The successful orbiting of AUSTRALIS OSCAR 5 is the culmination of four years of effort by a great number of people throughout the world. The satellite was designed and built by Amateur Radio members of the Melbourne University Astronautical Society. Les Jenkins, VK3ZBJ, later joined the project and built the command receiver for the satellite. Construction of AUSTRALIS OSCAR 5 was completed in June 1967 and it was delivered to Project OSCAR in San Francisco by three members of the Australis project. Project OSCAR tried unsuccessfully to obtain a launch for the satellite and the cause was taken up early in 1969 by AMSAT (Radio Amateur Satellite Corporation), a Washington-based group of Amateurs. AMSAT were successful in negotiating a launch with NASA and were responsible for the preparation of the satellite for flight.

It is significant that, while preparations for the launch of AUSTRALIS OSCAR 5 were going ahead, the Australis group became part of the Institute and is now known as W.I.A.-Project Australis. This was a logical step to take, especially when it is remembered that Australian Amateurs, through the W.I.A. contributed $400 towards the cost of building AUSTRALIS OSCAR 5.

INITIAL RESULTS FROM AUSTRALIS OSCAR 5

After a successful launching, AUSTRALIS OSCAR 5 (international name 1970-008B) separated from the Delta rocket over East Africa at 1237 GMT. Reports from 5R8AS, on the island of Madagascar, indicated that both the 144.050 MHz. and the 29.450 MHz. transmitters were operating and that everything looked good. On its first orbit of the earth, the satellite was tracked by Amateurs in India, Germany, France, England, Canada, America, New Zealand and Australia. At this stage, it is uncertain who had the honour of being the first VK station to hear AUSTRALIS OSCAR 5, but it was probably a VK4. The following stations reported reception on the first orbit:

VK4ZGL, VK4PJ, VK2OD, VK1CR, VK3ZBJ, VK3AVF, VK3ABP and VK-7PF. There are undoubtedly many more who monitored the first pass and a list of all Amateurs and S.w.l's who reported hearing the satellite during its transmitting life will be published in the next issue of "A.R."

Following the first few orbits, it became clear that the satellite's internal temperature had risen to a higher level than had been anticipated. It had been planned that the temperature should stabilise to about 25°C. and a special paint pattern was applied to the satel-

(continued on page 10)

Oscar 5 Satellite is weighed by Jan King in Spacecraft Lab. at Kennedy Space Centre, Western Test Range Operations Division, Vandenberg Air Force Base, Calif.

* Chairman, W.I.A.-Project Australis, 13 Nestan Drive, Ringwood, Vic., 3134.

AUSTRALIS OSCAR 5: IT'S IN ORBIT!*

By GEORGE JACOBS,† W3ASK

It's UP, it's finally UP, the AUSTRALIS OSCAR 5 satellite is flying!!! It made it successfully on 23rd January, 1970. After a lapse of almost four years, there's an Amateur Radio satellite again orbiting the earth, high in space.

At precisely 2 seconds past 1131 GMT on January 23, a giant two-stage Delta-N booster rocket began to lift slowly off its pad at NASA's Western Test Range near Lompoc, California. Amid a tremendous roar and a blinding blaze of flame and smoke, the 39-pound AUSTRALIS OSCAR 5 satellite, nestled in the framework of the giant booster, began its piggyback ride into space.

An hour and five minutes later, over South Africa, the Delta-N attained its orbital altitude of approximately 900 miles, and the AUSTRALIS OSCAR 5 satellite was ejected into space to become the fifth in a series of satellites designed and built by Radio Amateurs and Amateur Science enthusiasts, to successfully achieve an orbit in space.

Once in orbit, beacon transmitters aboard the satellite began transmitting telemetry data on 29.450 MHz. in the 10 metre band and 144.050 MHz. in the two metre band.

The first Radio Amateur to report receiving the beacon transmissions was 5R8AS as the satellite passed into range of his QTH on the island of Madagascar, off the south-east coast of Africa. He reported reception of the 2 metre beacon from 1238 GMT until it passed out of range at 1241.

Now that the AUSTRALIS OSCAR 5 satellite is in orbit, it has undergone some name changes. Officially, according to international agreement, the satellite has been given the designation 1970-008B. As part of the OSCAR concept, it now bears the official title of AUSTRALIS OSCAR 5, or unofficially, AOA 5 or just plain OSCAR 5 for short.

INITIAL OBSERVATIONS

As the satellite sped away from 5R8AS's QTH at a speed of 15,951 m.p.m., its initial orbit next took it into range of western Europe and the easternmost coast of North America. G2AOX, the OSCAR co-ordinator for Europe, reported good telemetry signals from the 2 metre beacon which he copied from 1244 to 1305 GMT, using a simple dipole antenna. Both G2BVN and G3DAH also reported reception of the 2 metre transmitter during its initial orbit.

DL3OJ and DJ4ZCA were among the first to report reception of the satellite's 10 metre signals. DJ4ZCA copied the signal from 1246 to 1303 GMT, and DL3OJ from 1246 to 1305 GMT.

Among the first to hear the 2 metre signal in North America was VE1AFB who logged it between 1302 and 1311 GMT, peaking S9.

WA1IOX at the Talcott Mountain Science Centre, Avon, Conn., was among the first U.S. Radio Amateurs to copy AOA5's signals during its initial orbit. He reported excellent reception of the 2 metre transmission between 1304 and 1312 GMT.

Ironically, during its initial orbit, the OSCAR 5 satellite passed within range of its birthplace at the University of Melbourne in Australia. Its signals were copied by the Melbourne University Radio Club between 1346 and 1358 GMT with solid telemetry reception.

It was a text book launch, and all indications were that the satellite was operating within its nominal design range, and the project was off to a good start. (At the end of the initial orbit, however, the modulation on the 10 metre signal was observed to drop off sharply, and later reports indicated that it was very difficult to decode the telemetry on this channel for this reason. As we go to press the reason for this low telemetry level has not been determined. The 2 metre telemetry circuit continues to operate properly.)

With each successive orbit, more and more Radio Amateurs throughout the world began to tune the satellite's signals, and by the end of the first day of operation, AMSAT headquarters had already received more than 100 tracking, telemetry and reception reports.

The 2 metre transmitter, which is operating continuously, is expected to have a life period of about a month, and may not be operating by the time this appears in print. The 10 metre transmitter, which will be operating primarily during week-ends, may still be operating during March. Be sure to check 144.050 MHz. daily and 29.450 MHz. on week-ends to see if you can receive signals from OSCAR 5. There may still be time.

FOUR-YEAR EFFORT SUCCESSFUL

The successful launch of the AUSTRALIS OSCAR 5 satellite culminates a four-year effort on the part of a large number of devoted Radio Amateurs on two continents.

The idea for the satellite was conceived during March 1966 by the members of the Melbourne (Australia) University Astronautical Society and the Melbourne University Radio Club. With the assistance of the Wireless Institute of Australia and the Australian electronics industry, the satellite was designed and built entirely by the Amateur participants. It went from drawing board to completion in little more than a year's time.

The completed satellite arrived at the west coast headquarters of Project OSCAR during July 1967, where it remained for more than a year and a half while attempts were made to cut away the red tape encountered in arranging for a piggyback launch.

During March 1969, with the formation of the Radio Amateur Satellite Corp. (AMSAT),[1] the Australian built satellite was shipped to AMSAT's Washington, D.C., headquarters. It took another nine months for AMSAT to put the satellite into final shape for launch acceptance, to arrange with NASA for the launch, and to wait out the many agonising delays caused by booster difficulties. But all this came to a happy and successful end at 1131 GMT on 23rd January, 1970.

BIG NEWS IN AUSTRALIA

The launch of OSCAR 5 made big news in Australia since this was only the second Australian-built satellite ever to make it into space. News of its launch was carried on the front page of many newspapers, and it was featured on radio and television as a major news story.

A direct commercial cable circuit was leased by the Australians between the University of Melbourne and the Oscar Control Centre at the NASA's Goddard Space Flight Centre, Greenbelt, Md. The line was in use for a three-hour period beginning about 15 minutes before launch. Every word and piece of information that was filtered through the control centre was fed live to Australia. The count-down and some of the control centre's commentary was carried live by radio and television stations in Australia.

In addition, W1AW [also VK2AWI and VK3WI.—Ed.] and several AMSAT stations operating in various h.f. Amateur bands, transmitted the count-down and the control centre commentaries live to Radio Amateurs throughout the world. After the satellite was successfully in orbit, these stations stood by to receive tracking and other reports bound for the control centre. At one point the amount of traffic flowing in and out of OSCAR control sounded much like Houston control during an Apollo mission!

INITIAL RESULTS

The following are initial orbital and signal data for the OSCAR 5 satellite confirmed by observer reports received during the first several days the satellite was in operation.

Date of launch: January 23, 1970.
Time of launch: 11:31:02 GMT.
Place of launch: NASA Western Test Range, Lompoc, California.

* Advance copy received from the author, and to be published in "CQ" for March 1970.

† Space Comunications Editor, "CQ," 11307 Clara Street, Silver Spring, Md., U.S.A., 20902.

[1] Information concerning membership in AMSAT can be obtained from AMSAT, P.O. Box 27, Washington, D.C., U.S.A., 20044.

Frequencies. 144 050 MHz. in 2 mx band, 29.450 MHz in 10 mx band.
Period 115.06 minutes
Inclination: 102 degrees (to the equator).
Altitude 910 miles apogee, 880 miles perigee.
Equatorial crossings 28.8 degrees progressively to the west for each new orbit in a south-to-north direction.

The 2 metre beacon transmitter seems to be operating perfectly. Maximum signal is just under a half microvolt, and the telemetry modulation is strong, sharp and clear. There appears to be some trouble with the 10 metre telemetry signals, however. As expected, because of propagation differences, this signal is somewhat weaker than the 2 metre signal, but unexpectedly the level of telemetry modulation is also very low. Many observers have reported considerable difficulty decoding the 10 metre telemetry signal for this reason.

Initial telemetry data indicates that the satellite is operating nominally within its designed range. Channel 1 indicates a battery current reading of between 60 and 70 mA. when both beacon transmitters are operating. Channel 3 indicates a battery voltage fairly stable at approximately 20 volts. According to Channel 5, the satellite's internal temperature which was as low as 25°C. during its initial orbit, has risen somewhat during the first few days of operation and appears to have stabilised at approximately 40°C. Channel 7 shows that the satellite's skin temperature varies between approximately 35 and 50°C., depending on whether it is in the earth's shadow or in full view of the sun.

Channels 2, 4 and 6 indicate that the satellite is spinning at its predicted rate.

FUTURE OSCAR SATELLITES

The effort that finally led to the successful launch of AOA5 is indicative of AMSAT's tremendous vitality. Even before the heat had time to cool at the launching pad, AMSAT officials were discussing future plans with high level NASA officials and with some of America's leaders in the field of space communications.

It's a bit too early to say what the next OSCAR satellite might be like, but AMSAT is busily evaluating and testing a two metre translator built by European Radio Amateurs, called EURO-OSCAR. At a recent conference of Region 1 (Europe and Africa) of the International Amateur Radio Union, a decision was taken for AMSAT to vigorously pursue the launch of the EURO-OSCAR satellite. If all goes well, perhaps this will be the next OSCAR satellite to make it in space.

With a success already chalked up, Project Australis, under the sponsorship of the Wireless Institute of Australia, proposes to build a channelised Amateur repeater as the next Australis-Oscar satellite. While plans have not yet been finalised, the use of the 144 MHz. band for the up-link and the 432 MHz. band for the down-link, along with the use of solar power, is being considered.

Longer range, AMSAT is investigating the possibility of including two Amateur experiments as a part of the huge ATS-G satellite to be launched by NASA during 1973. One proposed experiment is a channelised repeater aboard the satellite which would receive signals in the 144-146 MHz. band and retransmit them in the 420-450 MHz. band. Another ATS-G experiment proposed by AMSAT would consist of the transmission of Radio Amateur television signals for translation and relay back to earth by the satellite in the 432 MHz. band, where the signals would be receivable on regular home t.v. sets equipped with special low-noise converters and fairly high gain antennas.

There is even talk of plans for a moon-based OSCAR repeater to be brought to the moon by some future astronaut!

These activities are leading the way in demonstrating that Amateur Radio, through participation in space communication experiments, continues to make worthwhile contributions in the field of communications, and in furthering man's knowledge of science.

INTERESTING PRIMARY PACKAGE

Almost lost in the glare of excitement surrounding the OSCAR 5 satellite is TIROS-M, the primary package with which the Radio Amateur satellite was launched piggyback into space. This satellite is also of considerable interest to Radio Amateurs since it is the latest and the largest of a long series of operational weather satellites.

TIROS-M is the first in a new series of improved TIROS operational satellites, and now that it is successfully in orbit, will be called ITOS-1. This second generation operational weather satellite will not only more than double the daily weather coverage now possible from earlier satellites, but will do it at less cost, more effectively and during a longer lifetime.

ITOS-1 will provide cloud cover photos night and day, every 12 hours, and will relay these photos to earth via

Jan King and assistant instal Oscar 5 Satellite in position on launch vehicle at fourth level of gantry, SLC 2 West, Vandenberg Air Force Base, Calif.

an on-board Automatic Picture Transmission (APT) system. A relatively inexpensive ground receiving station can be used to receive APT weather transmissions, and many of them have been built and are operated by Radio Amateurs.[2]

ITOS-1 is in an orbit very similar to OSCAR 5, and is transmitting telemetry data on command on 136.77 MHz., and APT data on command on 137.5 MHz.

SOME FIRSTS

Among the **firsts** chalked up by AOA5 are the following:

- First Radio Amateur satellite to be launched by NASA. The four previous OSCAR satellites were launched by the U.S. Air Force. With launches now possible under civilian auspices, the OSCAR programme has considerably greater flexibility than in the past.
- First satellite to operate in the 10 metre band. All previous OSCAR satellites operated in either the 144 or 432 MHz. bands, or both. This makes it possible for a much greater number of Radio Amateurs to copy OSCAR 5's signals than was possible with previous satellites.
- Along with the TIROS-M primary package, OSCAR 5 was the first satellite to be launched by a two-stage Delta-N booster rocket. The Delta-N, used for the first time, contains six solid-fuel strap-on rockets for additional thrust at lift-off.
- First Radio Amateur satellite to be command controlled from the ground. The satellite's 29.450 MHz. transmitter will be turned on and off from the ground to permit week-end operation only, in an effort to conserve battery power.
- First Amateur satellite to contain a magnetic self-stabilising system (MASS), to reduce spin, roll and signal fading.

Along with these firsts is also a second. The satellite is the second built by Australians to be launched successfully. WRESAT-1, launched on November 29, 1967, is the only other Australian-built satellite to make it into space. This was a scientific satellite which made solar and ionospheric observations.

HISTORICAL OSCAR DATES

Dec. 12, 1961-Jan. 1, 1962: OSCAR 1, Amateur Radio's first satellite, transmitted telemetry data on 2 metres.

June 2-June 26, 1962: OSCAR 2 transmitted telemetry data on 2 metres.

March 9-24, 1965: OSCAR 3, Amateur Radio's first translator in space operated up and down-links in the 2 metre band. A 2 metre telemetry beacon transmitter continued to operate until July 9, 1965

Dec. 21, 1965-mid-March, 1966: Operational period of OSCAR 4's translator, with the up-link on 2 metres and the down-link in the 432 MHz. band.

Jan. 23, 1970 . . .: Launch of OSCAR 5 at 1131 GMT with 10 and 2 metre beacon telemetry transmitters.

[2] C. H. Vermillion, "Constructing Inexpensive Automatic Picture-Transmission Ground Station," NASA Report SP-5079: 1968, available from NASA, Code UT, Washington, D.C., U.S.A., 20546.

OSCAR 5 ORBITS THE EARTH

(continued from page 7)

lite to achieve this figure. After several days in orbit, the satellite's internal temperature stabilised at about 43°C. It is not known at this stage why the temperature rose to this figure, but, as the satellite had been successfully tested to 80°C. before launch, the 43°C. figure has not caused any real concern.

The modulation level of the 29.450 MHz. transmitter has been observed to be very low. Reports have varied from 5 to 40% modulation, with the higher frequency telemetry tones being very difficult to decode. It was originally thought that there may be a problem in the 29.450 MHz. modulator which was keeping the transmitter duty cycle on more than planned, but subsequent commanding off of the 10 metre transmitter has shown that it is drawing normal current from the battery, indicating that the modulator is operating properly. The answer will probably have to await detailed analysis of the telemetry data from the satellite. The 10 metre transmitter is apparently radiating full power.

The 144.050 MHz. transmitter seems to be operating normally, with close to 100% modulation reported by VK3ZBJ. With average to good signal to noise ratios, most stations have reported that they can receive and decode the 7-channel telemetry data without too much difficulty.

About a week after the launching, the horizon sensors (photo-transistors) mounted on the sides of AUSTRALIS OSCAR 5 indicated that the Magnetic Attitude Stabilisation System (MASS) was lining the satellite up with the earth's magnetic field. MASS consists of a bar magnet and hysteresis rods. The idea of using this system was to stop the satellite from tumbling randomly in space and to stop fading due to tumbling on the 10 metre signal and reduce it on the 2 metre signal. The system appears to be working very well. One point of interest is that daytime (northbound) passes of the satellite over Australia have yielded good signals as the spacecraft comes over the horizon, but these signals have tended to weaken as the point of closest approach to the tracking station is reached. As AMSAT have reported that they are getting extremely good 2 metre signals over the U.S., this indicates that the satellite's 2 metre transmitting antenna is pointing away from the earth as it travels north from the south magnetic pole.

An American Amateur station in Connecticut had the honour of being the first to successfully command the AUSTRALIS OSCAR 5 satellite. On orbit 61, on 28th January, the Connecticut station sent a coded command to the satellite and turned off the 29.450 MHz. transmitter. However, Les Jenkins, VK3ZBJ, who built the satellite's command receiver, was not far behind. He succeeded in commanding the 10 metre transmitter on again on orbit 72, on 29th January. Since then, Les has demonstrated that he can command the 10 metre transmitter on and off at will. These tests represent the first time that any ground control has been exercised over an Amateur Radio satellite and they show the degree of sophistication of which Amateurs are capable.

At the time of going to press, AUSTRALIS OSCAR 5 has been orbiting the earth for 15 days. At this stage it seems likely that the 2 metre signal will be audible for about another two weeks and the 10 metre signal should continue for about another four week-ends, before the satellite's chemical batteries are exhausted.

[**Stop Press** — On 14/2/70 the 10 metre transmitter was turned on and will remain on for the duration of the satellite. This change of plan became apparent when it was found difficult to turn the 10 metre transmitter on with the reduced voltage available. At this date also, the 2 metre transmitter was so weak that telemetry data was unreadable.—Ed.]

THE NEXT STEP—AUSTRALIS OSCAR 6

AUSTRALIS OSCAR 5 is essentially a test satellite and the forerunner of bigger and better things to come. Its main purposes were to provide Amateurs throughout the world with a test and training satellite so that they could learn the techniques of satellite tracking and data decoding and to conduct a number of experiments in satellite technology and radio propagation. The satellite also served as a training ground for the Radio Amateurs who are going to build AUSTRALIS OSCAR 6.

The design of AUSTRALIS OSCAR 6 is already well advanced. It now seems likely that Australian Amateurs will build the electronics for the satellite and that AMSAT will finish the spacecraft structure and power supply. There is also a possibility that a translator built by DJ4ZC will be carried in the satellite.

AUSTRALIS OSCAR 6 will be the most advanced Amateur Radio satellite ever launched. VK3ZBJ is now working on a channelised translator for the satellite which will also carry multi-channel telemetry and command systems. It is hoped that the satellite will have an active life of one year, using a solar cell power supply.

AUSTRALIS OSCAR 5 has proved that Australian Amateurs, given the necessary support, can build a satellite that will work. There is no reason to suppose that, given the backing of Radio Amateurs and of industry, W.I.A.-Project Australis cannot again deliver the goods to AMSAT. If AMSAT's enthusiasm and success in getting AUSTRALIS OSCAR 5 into space is any indication, there should be yet another Amateur Radio satellite orbiting the earth in the not too distant future.

CONTEST CALENDAR

28th Feb./15th March: I.A.R.C. Propagation Research Contest (c.w. and r.t.t.y.).

7th/8th March: 36th A.R.R.L. International DX Competition (phone).

7th/8th March: B.E.R.U. (c.w. only).

21st/22nd March: 36th A.R.R.L. International DX Competition (c.w.).

28th Mar./19th April: I.A.R.C. Propagation Research Contest (phone).

15th/16th August: Remembrance Day Contest.

3rd/4th October: VK/ZL/Oceania DX Contest (phone).

The Multiband Double Dipole

TED GABRIEL, VK6TG (ex-VK2AVG)*

While the operation of an Amateur Station in remote areas may not, at first glance, appear difficult with present-day equipment, the writer encountered several problems when operating in a modern construction camp in the North West.

Construction workers in this area are housed in air-conditioned, metal clad trailer units and the wide use of short wave transistor radios makes an outside aerial necessary.

The result is a weird jungle of "spider webs," "d.f. loops" and "bird cages on sticks" into which the Amateur operator must tread warily when erecting a transmitting antenna.

A multiband "trapped" dipole (K2GU) was tried first, the traps being carefully resonated with a grid dip oscillator. After adjustment, the antenna appeared to work well on 40 and 20 metres, but there were complaints of b.c.i. from those listeners close to the antenna.

Checks with an s.w.r. meter indicated the presence of standing waves on the feed-line, though these were not excessive. More importantly, since this type of antenna is a compromise, it was realised that harmonics were probably being radiated—possibly from the traps.

It was then decided to revert to simple dipoles with the hope of attaining low s.w.r's, and the following multiband design was developed using a single 75 ohm co-axial cable feed-line.

CONSTRUCTION

As indicated in Fig. 1, the upper dipole is cut for a half-wave on 40 metres (7075 KHz.) and the lower dipole for a half-wave on 20 metres (14,175 KHz.). Leave sufficient wire in the end loops for adjustments and fasten with electrical service connectors.

The central insulator of the upper dipole has a ¼" thick perspex sheet attached to it and the lower dipole can be fastened through holes in the bottom corners of the sheet, or to another insulator fastened to the bottom edge of the sheet (see Fig. 3).

The upper dipole supports the lower one by means of perspex spacers (3½" x ½" x 3/16"), the separation between the wires being 2¾"—though the spacing is not critical.

* C/o. Bechtel Pacific Corporation Ltd., Port Hedland, W.A., 6721.

From the end insulator of the lower dipole to the far end spacer a length of carpenter's nylon chalk line is ideal for tensioning.

Support the antenna from the end insulators of the upper dipole and run another light rope from the bottom of the end spacer to the mast to tension the lower dipole and square up the array.

The 75 ohm co-axial cable can be attached to the centre perspex sheet directly or with fittings. The centre conductor of the cable is joined to one side of both the upper and lower dipoles and the braid is joined to the other two sides (Figs. 2 and 3).

Adjust the length of the upper dipole for resonance on 40 metres (this will correspond to 1½ wavelengths on 15 metres) and the lower dipole for 20 metres. The extra wire at the ends and the use of service connectors facilitates this task.

An s.w.r. bridge is essential in order to obtain the lowest possible values when tuning, thus helping to avoid b.c.i. and t.v.i.

(continued on page 15)

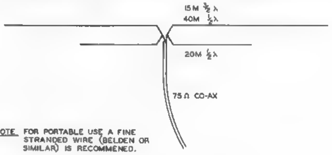

Fig. 2

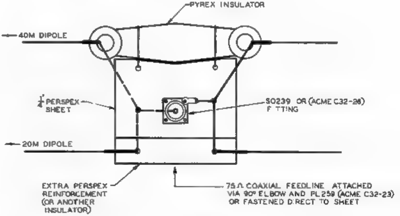

Fig. 3

VK6TG MULTI BAND DOUBLE DIPOLE FOR 40,20 & 15 METRES

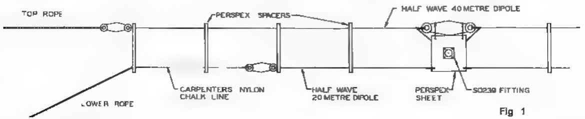

Fig 1

A Hub for Tri-band Spider Quads

S. T. CLARK,* VK3ASC

THERE is romance in the story of the invention of the Quad aerial at short wave broadcasting station HCJB at Quito, 10,000 feet up in the Ecuadorian Andes in 1939, and Bill Orr, W6SAI, tells the story without frills in his excellent book, "All About Cubical Quad Antennas". (The title is intended to indicate that the book is devoted entirely to this subject.)

An aerial with the characteristics of the Quad cannot fail to appeal to Amateurs. In the thirty years that Quads have been in existence we have seen many papers published on various designs and the aerial has been highly developed until versions are now available which are capable of operation on at least three bands. The majority of Amateurs and manufacturers have confined themselves to designs using a boom although there have been some designs published which use two pyramids, apex to apex, to achieve identical electrical spacing on each of the operating bands.

The writer does not claim to have studied everything that has been written on the subject, but he has read most of the articles which came his way during the last thirty years and has never ceased to be amazed at the ingenuity of the designs presented.

Single-band aerials do not appear to present any special problems for constructors of reasonable mechanical ability, the "Bird Cage" and "Swiss Quad" are interesting, and, no doubt, effective versions of the Quad, but multi-band versions of these designs are mechanically complex.

Increased interest in DX recently caused this subject to be studied afresh and it appeared that a set of broad specifications could be set down:

1. Construction should be simple enough to be completed satisfactorily by Amateurs of limited ability working with hand tools.
2. The aerial should be capable of operation on the three DX bands of 14, 21 and 28 MHz.
3. The impedance should be constant on all bands to minimise matching problems.
4. It should be capable of being fed by one feedline if required.
5. The aerial should be light in weight and operated with a lightweight rotator (maximum weight 25 lbs.).
6. Forward gain should be about 6 db. with a good front-to-back ratio.

The A.R.R.L. Antenna Book (11th Edition) was studied, but found to be greatly lacking in detail. Other references were also studied such as past issues of "QST" and "A.R." which were on file. Because of the criterion that the impedance should be constant on all bands, the design had to consist of two pyramids apex to apex. An article "Close Spacing the W3QEF Quad" by Kridler in "QST" for January 1962, in which a number of earlier references are given, contained most of the answers. An even more informative article, "The Spider Quad" by Peter B. Langenegger, HB9PL, appeared in "QST" Dec. 1967. Langenegger's ingenious design appeared to offer the answers to all of the problems inherent in the construction of a tri-band Quad.

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● About three years ago the author set out to build a three-band cubical Quad aerial. After he had studied much of the available literature and refreshed his memory on other points, it appeared that the construction of this type of aerial was seriously inhibited by the lack of a suitable hub fitting on which the aerial could be constructed.

Midnight oil was therefore burned in an effort to evolve a design which would be of interest not only to VK3ASC but also to other Amateurs. The cast aluminium alloy hub presented here provides an economical solution to the problem of building and adjusting a very practical aerial for operation on the 14, 21 and 28 MHz. DX bands.

Since the hub is only the core of the aerial and correspondence indicated that many Amateurs were interested, but were doubtful as to how to proceed with other facets of the construction of a complete system, the author discusses the various alternatives in an objective manner in an effort to assist intending constructors. Once an Amateur has the hub the complete aerial can be constructed using simple hand tools.

HUB PROBLEM

When it was decided to proceed with construction and procurement action commenced, it was found that purchasers of a few pounds of steel tubing and plate cut into thirteen separate pieces were not very welcome at the steel yards. In any case, the pieces had to be welded together, the assemblies cleaned, and then the whole taken to a galvaniser. Even though the writer has trained as a turner and fitter and has a workshop which is well equipped by Amateur standards, it appeared that the "ultimate" answer had not been found to the hub problem.

Was there an answer that had not appeared in the literature?

Re-reading the available literature highlighted the fact that all of the hub assemblies described were fabricated from a number of pieces of steel plate, tube or angle, and that they were essentially "one off" designs with a very high labour content.

Having had some success with aluminium castings on another project, it was decided to thoroughly investigate this method and a number of models were made up in wood and plastic to test the concept. By this stage some basic ingredients had been worked out. It appeared desirable that each half of the Quad, i.e. each pyramidal set of loops should be entirely separate for ease in assembly, after which the two halves could be bolted together on a vertical support tube, to form the complete Quad.

A wooden model of one half was therefore made and taken for discussion with a pattern maker (who turned out to have an uncle who was an Amateur) and the finer details were thrashed out. The final design appears to meet the needs of the majority of Amateurs who require to build an aerial of this type and the cost of professionally produced pattern and core box for the production of professional castings appears to have been more than justified by the better job which is obtained.

From the response that the writer has had to date it would appear that the construction of two element tri-band Quads has been seriously inhibited by the lack of a suitable hub assembly and that the way is now open to anyone of modest ability and means to erect a Quad which is very largely of his own construction.

VK3ASC HUB SPECIFICATIONS

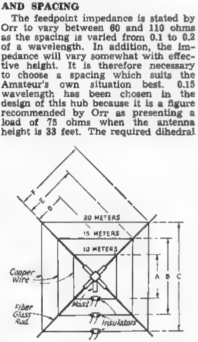
The hub consists of two aluminium alloy castings bolted base to base. Assembled dimensions are 6" x 6" x 4¾". Weight, 4½ lbs. complete with galvanised mounting bolts, nuts and washers. Eight sockets 1" diameter by 2" deep are provided to accept the spreaders which enter the assembly at a dihedral angle of 22½° to the base surface which is formed to fit a tube 1.9" diameter (1½" water pipe) and the centre of which is co-axial with the support tube. This surface is referred to in this paper as "the neutral plane".

A dihedral angle of 22½° gives a spacing of 10' 8" (0.15 wavelength) which is stated by Orr to give a feedpoint impedance of 75 ohms when the centre of the antenna is 0.5 wavelength (33') above ground level. Spacing may be adjusted as described later. Spreader length required, 14.1' for a loop 18.5' on a side. Spreader fixing method: cementing with "Araldite" is recommended. Grub screws may be used if desired.

To provide the answers to questions which have been asked by many VKs during the last few months, some alternative methods of construction and certain design points are discussed below.

FEEDPOINT IMPEDANCE AND SPACING

The feedpoint impedance is stated by Orr to vary between 60 and 110 ohms as the spacing is varied from 0.1 to 0.2 of a wavelength. In addition, the impedance will vary somewhat with effective height. It is therefore necessary to choose a spacing which suits the Amateur's own situation best. 0.15 wavelength has been chosen in the design of this hub because it is a figure recommended by Orr as presenting a load of 75 ohms when the antenna height is 33 feet. The required dihedral angle is 22½°, which can be easily obtained. Forward gain is about maximum at this spacing and the spreader arms are shorter and stiffer than for 0.2 wavelength.



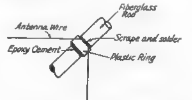
	A	B	C	D	E	F
RAD.	8' 7"	11 8"	17' 7"	6' 3"	9' 6"	13' 5"
REF	9' 0"	12' 3"	18' 5"	6' 3"	9' 6"	13' 5"

Element dimensions and insulator placement for the Spider Quad. The figures in columns D, E and F are only approximate.
(From "QST" Dec. 1967)

ADJUSTING THE SPACING

1. By making the spreaders a loose fit in the sockets, they can be adjusted to the required angle and allowed to set at the chosen angle.
2. Casting wall thickness is ¼"; this is more than necessary and sockets may, if desired, be re-machined to a different angle.
3. If aluminium or steel tubing is used for the inner spreader sections a permanent "set" of a few degrees can easily be put in the spreaders by bending over the knee or with an electrician's bending tool.

Small variations from the recommended spacing are not considered to be significant.



A method of fastening the antenna wire to the fibreglass rods.
(From "QST" Dec. 1967)

SPREADERS

The most aesthetically pleasing effects are obtained if tapered spreaders are used. For many years it was common practice to use bamboo fishing poles for this purpose. Although inexpensive, about $12.00 (80c/lb.) for a set of eight 16-18 feet nominal starting length, some Amateurs consider them to have a short lifetime. One Amateur of the writer's acquaintance has a set still in operation after seven years. For this reason they are considered to provide a solution which is acceptable to many.

Tubular fibreglass fishing rod blanks are probably the best "standard production" raw material for spreaders because they are strong, light in weight, straight and need no painting. 11' 6" tubular fibreglass blanks weigh a modest 9½ oz. and cost $9.00 each. Longer blanks will cost considerably more. The price almost doubling between 11' 6" and 13' 6".

If you are keen to have the best without incurring the expense of "all fibreglass" spreaders, it is reasonable to fit about five feet of 1" diam. 17 s.w.g. aluminium alloy tubing in the centre of the pyramidal assembly as the 28 MHz. loop is attached at about the 7' mark. Of course, bamboo (Rangoon Cane) could also be used for the outer ends of composite spreaders.

VK3ASC's plans at present are confined to the use of 14' canes fitted directly into the hub sockets, the only metal in the structure is the hub and the elements.

Serious experiments have not been conducted with fibreglass because of the high cost, but it is known that other Amateurs have used tubular fibreglass for spreaders and it is hoped that an opportunity to try this material may present itself during the next year.

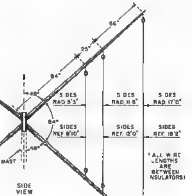
In the meantime Rangoon Canes of the semi-solid variety, nominally 16-18' in length have been selected from bulk stocks to be similar in length, taper, and weight with butts approximately 1" diameter. The butt is ground reasonably cylindrical on a 10" diameter disc grinder for more than two inches, about 1/32" smaller in diameter than the sockets which are 1". Tips are then removed beyond the first knuckle past the 14' mark where the cane is 5/16" to 3/8" in diameter.

These canes are now a loose push fit into the hub sockets and at this stage are given a protective coating of good quality exterior house paint. Primer, undercoat and two top coats were applied according to the paint manufacturer's directions.

ALL-METAL SPREADERS

It has been reported that the satisfactory operation of Quads is impaired by large pieces of metal within the immediate field of the aerial. Some American manufacturers have been offering spreaders made of aluminium alloy tubing in their Quad kits for a number of years and so they cannot be useless.

One manufacturer who has recently commenced advertising Quads states in his advertising that his tubing supports are broken up by the judicious use of insulating material and it is suggested that an Amateur could devise spreaders consisting of a number of pieces of aluminium alloy tubing of about 18 s.w.g. wall thickness for the inner 1" diameter sections and then reducing by 1/8" steps to about 3/8" o.d. at the tips, the joints would only need to be three to four times the tube diameter for maximum strength and the smaller tube could be wrapped with polythene or similar film to insulate it from the outer at each of the joints.



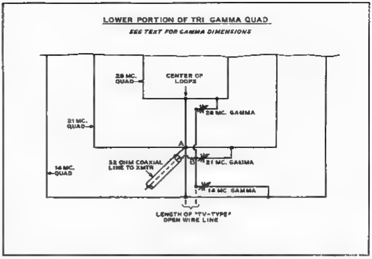
Side view showing the spacing between elements for a W3OEF close-spaced Quad Opposing elements, not shown, are similarly spaced.
(From "QST" Jan 1962)

If the last half inch or so of the outer tube is slit with a hacksaw at the ends, then a few turns of stainless steel wire of about 18 s.w g. could be twisted around the end to hold the tubes firmly together mechanically with the film forming an insulator between them. Such a construction form would ensure that the spreaders are broken electrically into pieces which are too small to interfere with the operation of the beam.

FIXING THE SPREADERS

As supplied, the hub has no special method of fixing the spreaders into the sockets. The recommended method is to use "Araldite" or other epoxy adhesive. A wood or hardboard plate 6" x 6" is made with two holes matching the outer holes in each half of the hub. These should be about ¼" diam. and two bolts about 2" long will be required for temporary use whilst the epoxy is setting. The bolts hold each hub half down onto a piece of tubing of identical diameter to that of the support structure with a small piece of polythene film interposed to prevent adhesion.

An alternative is to use grub screws which may be hidden in the inside pockets.



Tri-Gamma feed system is well suited to 20-15-10 metre Quad. The gamma wires are adjusted to reduce interaction as well as to provide a proper impedance transformation. Gamma capacitors are used to resonate system.

(From "All About Cubical Quad Antennas")

ERECTING THE PYRAMIDS

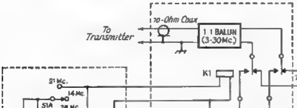
Using builder's layout techniques, a jig was set up in the back lawn. An area at least 20' square is required. Four garden stakes about 8' long are required to form the corners of a square 18' 6" on a side. Lines are run across diagonally to establish the geometric centre of the square and a short stake about 18" or 24" long made from a piece of 2" x 3" hardwood is driven vertically into the ground and a nail driven into it vertically where the two diagonals cross. The top of this stake need only be about six inches above ground level.

Fix a piece of hardboard/plywood 6" square to the top of this centre stake with its diagonals running out to the corner stakes. Fix the first half of the hub, resting upon a short length of 1½" water pipe, with polythene film interposed between the metallic surfaces, to this square with ¼" bolts.

With the builder's line establish a horizontal "reference plane" at some suitable point on the corner stakes. If the ground is not level and flat this may not be at the bottom of the hub half, which is the most convenient point. This is fairly easy to do using a spirit level or builder's "line level" placed in the centre of each span of line.

The position at which each spreader is to intersect the corner stakes is now marked on each stake in accordance with the element spacing you have decided upon. About 4' 6" from the bottom of the hub for 1/8th wavelength spacing, and about 7' from the bottom of the hub for 1/5th wavelength spacing. i.e. half the element spacing.

Mix a quantity of epoxy cement and put the required amount into each of the sockets. There should be enough for some to just ooze out as the spreader bottoms, forming a fillet where spreader and hub join. Fix the tip of No. 1



Method of feeding the Spider Quad and of selecting the desired radiator. K1 and K2 are d.p.d.t. mercury relays with 115v. a.c. coils. S1 can be either a 2-pole, 3-position rotary or a d.p.d.t. toggle switch with a centre-off position.

(From "QST" Dec. 1967)

spreader to number 1 stake at the appropriate point. Repeat the process next with the opposite spreader and then the other two. By sighting along the spreaders it is a relatively easy matter to ensure that they are straight, and that they form the corners of a neat pyramid.

During the curing process, the wire elements can be measured (twice) and then cut, making due allowance for the tails to attach the centre insulators in both elements and to form the stub on the reflector.

FIXING THE ELEMENTS TO THE SPREADERS

A number of methods can be used.

1. Drill holes in the spreaders at appropriate places, thread wire through and wire into place. Not desirable as it permits moisture to enter.

2. Use small porcelain insulators at each corner which are fixed to the spreaders with wire droppers, as per W3QEF and others. Considered to be rather unsightly.

3. Epoxy a plastic ring to the spreaders and form a metal eye outside the ring to which the aerial element is wired and then soldered; a la HB9PL. Considered to be very good but perhaps a little difficult of adjustment.

4. Labgear Ltd. of England recommend the use of 3" of fibreglass sleeving 1.5-3 mm. in diameter, obtainable from electrical insulation supply houses at each corner through which the loops pass (24 required) which are in turn lashed to the spreaders with nylon thread or line. Simple and neat.

5. Plastic eyes can be made from polystyrene, perspex or other material such as old toothbrush handles, which can be fixed to the spreaders in a manner similar to that used for fixing runners to fishing rods. Runners could, in fact, be used if desired.

When the first assembly is complete and the epoxy has set, it may be re-

moved from the jig and the second half assembled. At this point it is probably wise to point out that it is almost impossible to make two identical hub halves; these have a mark on them indicating the way they "match" and should be re-assembled in this fashion, it is therefore wise to check that these index marks will line up when the halves are completely assembled.

Now that each assembly is complete, it is only necessary to fix the support tube so that it is cantilevered out about ten feet some six feet above the ground. If this is fixed firmly in a horizontal plane with the bolt holes vertically above one another, it will be easy enough to carry the number one assembly with the long fixing bolt in it and drop it into position on the tube. The second assembly can now be manoeuvred into position beneath the tube, and moved vertically upwards until the mounting bolt can engage the threads. Fit all three bolts loosely into position and tighten evenly. Fit washers and lock nuts and you are ready for a hoisting party.

ADJUSTMENT

Complete details are given in "All About Cubical Quads," by William I. Orr, W6SAI, and also in "QST" for December, 1967. An extract from this "QST" follows:

"The only elements in the Spider Quad that require adjustment are the reflectors. Tuning can be accomplished by feeding power to the antenna and adjusting each reflector stub for minimum field strength as measured on a simple field strength meter located in back of the antenna. However, this procedure requires three men, if the job is to be done within a reasonable length of time. One man slides a shorting bar up and down the reflector stub, one controls the rig, and one measures the field strength. This was the first method we used; however, after one of the men was burned by r.f. on a reflector, we quickly sought a safer and easier way.

"In the procedure arrived at, no transmitter is needed. We made a simple transistor crystal oscillator that would supply a signal in each band, and hung the unit by two 10-foot copper wires in a tree that was approximately 150 feet from the Quad. The supporting wires served as an antenna for the oscillator. Alignment was accomplished by pointing the back of the Quad at the distant oscillator and adjusting each reflector stub for a minimum S meter reading on the station receiver."

FEEDING

"All About Cubical Quads" carries some information on this, and in "QST" Dec 1967 HB9PL suggests a very practical method. Since all elements in this system are an identical portion of a wavelength apart, the feed point impedance will be similar and the three driven elements may be connected in parallel and fed with suitable twin line or co-ax. if desired.

Since the impedance at the feedpoint of the Quad will vary with the spacing of the elements and the height above ground it may be necessary for individual constructors to study their own situations and so arrange the variables so that a low v.s.w.r. will be presented to the transmitter by the assembled and adjusted system.

VK3SM, Alan Crewther, suggests that if the reflector is 5% larger than the driven element a tuning stub will be unnecessary.

DRIVEN ELEMENT

	Loop	Side
	$\frac{1005}{F}$	$\frac{250}{F}$
MHz.	Feet	Feet
14.2	70.50	17.60
21.2	47.25	11.80
28.8	34.75	8.68

REFLECTOR

	Driven Elem. + 3%		Driven Elem. + 5%	
	Loop	Side	Loop	Side
	$\frac{1030}{F}$	$\frac{257.5}{F}$	$\frac{1050}{F}$	$\frac{262.5}{F}$
MHz.	Feet	Feet	Feet	Feet
14.2	72.50	18.15	74.00	18.50
21.2	48.25	12.15	49.60	12.40
28.8	35.75	8.94	36.50	9.125

SPACING (Wavelength)

	0.125λ	0.135λ	0.15λ	0.2λ
	$\frac{125}{F}$	$\frac{135}{F}$	$\frac{150}{F}$	$\frac{200}{F}$
14.2	8.80	9.50	10.56	14.1
21.2	5.90	6.37	7.08	9.45
[illegible]	4.34	4.68	5.22	6.94

PYRAMID HEIGHT

14.2	4.40	4.75	5.28	7.05
21.2	2.95	3.18	3.54	4.73
28.8	2.17	2.34	2.60	3.47

SPREADER LENGTH (Calculated for Reflector)

14.2	13.79	13.90	14.09	14.65
21.2	9.24	9.30	[illegible]	9.95
28.8	6.72	6.77	6.86	7.75

ANGLE TO NEUTRAL PLANE FOR REQUIRED SPACING

16.5°	20°	22°	28.3°

Having estabished the length of a side on any loop, it is relatively easy to calculate the length of the half diagonal which is $\sqrt{2}$ × half the side, or ($\sqrt{2}$ × side) ÷ 2 = (1.414 × side) ÷ 2.

Since the vertical height of the triangle of which the spreader forms the hypotenuse equals half the desired spacing, and the base is equal to ($\sqrt{2}$ × side) ÷ 2, then the length of the spreader for any desired spacing will be

$$\sqrt{\text{base}^2 + \text{height}^2}$$

and the angle to the neutral plane, i.e. along the support axis and the join in the two castings can then be found from trigonometrical tables because the cotangent of the angle = base ÷ height, or tangent of the angle = height ÷ base.

Total amount of wire needed: 350 feet; this allows a small safety factor and includes stubs.

Weight:

350' x 0.064" (16 s.w.g., 14 a.w.g.), 4 lb. 6 oz.

350' x 0.051 (16 a.w.g.), 2 lb. 12 oz.

Hub, 4 lb. 8 oz.

Spreaders (Bamboo), 12-15 lb.

Nylon Line (100 lb.), abt. 2 oz.

RECOMMENDED REFERENCES

"All About Cubical Quad Antennas," by William I. Orr, W6SAI.

"The Spider Quad," by Peter B. Langenegger, HB9PL. "QST" Dec 1967.

"Close Spacing the W3QEF Quad," by Irvin D. Kridler, W7BTB "QST" Jan. 1962. A number of earlier references are given in this latter article and although many of these have been studied, it is believed that the references given above are sufficient for the purpose. For one thing, most of the papers which precede Kridler deal only with the so-called "compromise spacing" type of three band Quad if a three band Quad is described.

Another reference which is strongly recommended, especially if the intending constructor is not proficient in knotting, is "Knots and Rigs" by Dick Lewers. This book was written for fishermen and will prove invaluable to the Amateur as it is necessary to use fishermen's techniques for some of the fixing.

☆

MULTIBAND DOUBLE DIPOLE

(continued from page 11)

There does not appear to be much interaction between the dipoles and the following average s.w.r's were obtained at VK6TG with the antenna only 25 feet above ground:

15 metres ..	1.8 to 1
20 metres	1.6 to 1
40 metres ..	1.1 to 1

No doubt these figures could be improved on under better conditions, but S9 reports have been received from Singapore and the Pacific area on 15 metres with a modest 65 watts p.e.p.

My thanks to VKs 6CT, 6RG, 6KJ and others for reports. Chris VK6CT has built a similar antenna for 20, 15 and 10 metres.

This simple multi-band antenna could be the answer for city dwellers with limited space as well as being a compact portable unit.

A SOLID STATE AMATEUR S.S.B. RECEIVER

PART TWO

*B. G. CLIFT and A. E. TOBIN**

The second of a series of articles by Fairchild engineers describing the circuitry and construction of a Solid State Amateur S.S.B. Receiver. This article describes the design concepts, circuit operation and construction of the 9 MHz. filter and i.f., beat frequency oscillator, product detector and a.g.c. system. (Part One appeared in "A.R.," October 1969, page 13.)

Many varied techniques have been tried to optimise the performance of this section. The basic requirements are set down as follows:

(1) To amplify and detect a single sideband signal approximately 10 μV. to provide adequate input level to the audio amplifier and a.g.c. system.

(2) To reject as much as possible spurious signals and provide a relatively flat passband of 3 KHz.

(3) To maintain constant output over a wide range of input voltage.

(4) To handle relatively large input levels without severely distorting the modulation envelope.

(5) To provide some form of signal strength indication.

(6) To enable selection of either the upper or lower sidebands and maintain good carrier re-insertion stability.

(7) The detection system to also be functional for amplitude modulated signals.

FILTER

To maintain the concept of versatility from the point of view that some sections may at a later date be used as part of a system for the generation of a sideband signal, the filter section was not integrated into the design of the i.f. amplifier. It is better kept as a separate block with input and output buffers. The circuit used is described by Pye for use with the 9-0A crystal filter. There was no need to alter that design since it fulfilled our requirements as a functional block.

The bandpass response of the filter did not quite come up to expectations. It suffered from a 6 db. peak at the low frequency end which could not be fiddled out by the trimmer pads on input and output. The trimmers appeared to have only minor affect on the harmonic peaks on either side of the skirt and so consequently were left out.

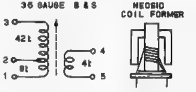
I.F. AMPLIFIER

The i.f. amplifier block caused a great deal of concern since the original conception was to use an integrated circuit (the uA703C). However, basic limitations on the 703 as an a.m. i.f. amplifier were realised and a discrete design was considered necessary.

The uA703 was designed as an f.m. i.f. amplifier or limiter, and as such provides a limiting action by the use of a constant current tail which allows limiting to occur without either transistor in the differential pair saturating. From a limiting point of view, this is ideal because the tuned circuit loading is not increased at the limiting level and bandpass remains constant.

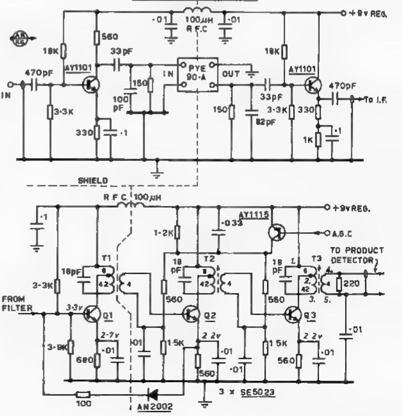
In controlling the gain of the uA703 the low input is pulled down to reduce the tail current and hence the gain. But in so doing the limiting level also decreases, hence with the required gain reduction ($\approx$60 db.) the output in the unlimited region is so low as to be unusable. Because our a.g.c. is audio derived, a secondary effect of the limiting action is to completely block the receiver once the modulation is clipped off. The inability to handle large signals without limiting, forced us to use a discrete design, which, although it appears more complicated and difficult to construct, proved far superior for this application.

Three voltage biased SE5023s were used for their excellent forward a.g.c. action. Two stages may have been just adequate, but would be more critical in construction since the 25 db. gain per stage required would decrease the stability margin to a dangerous level. Three stages, on the other hand, operating at about 20 db./stage would be



DETAILS T1, T2 & T3

9 MHz. FILTER & I.F.



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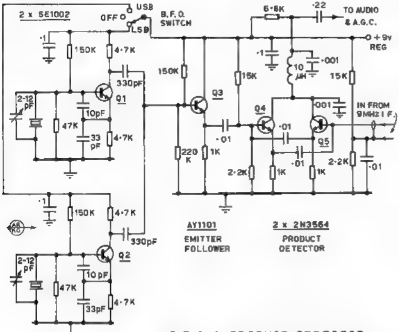
more docile and would enable a superior a.g.c. action.

The i.f. transformers were wound on a standard Neosid former type "A". The dynamic impedance of each is approximately 30K ohms with a loaded Q of 10, providing a bandwidth of approximately 300 KHz. Care must be taken when winding the coils to make sure that the secondary is wound very close to (or on top of) the "cold" end of the primary. This close coupling is essential to provide stable operation of each stage.

the a.g.c. range is in excess of 100 db., but this is deliberately limited for the above reasons to about 60 db.

A.g.c. control on the first device is achieved by making use of the current gain in second device and providing a threshold level for its operation, i.e. until the emitter of Q2 reaches 3.9 volts, Q1 is operating at maximum gain. When the diode turns on, it has in itself an a.g.c. effect since it loads the output from the filter block with 100 ohms plus the dynamic impedance of the diode. This system improves the



B.F.O. & PRODUCT DETECTOR

A.g.c. action is provided on all three stages. The last two devices are turned "on" via the AY1115 a.g.c. amplifier. The current required into the base of the AY1115 to give full a.g.c. control will be dependant on its current gain. This is compensated for by varying the series resistor to the a.g.c. block so that its full output swing is utilised. In effect what we are doing is decreasing the loop gain of the a.g.c. system such that we introduce an increased slope in the a.g.c. curve (i.e. e_{IN} versus e_{OUT}). Ideally this is not a desirable feature since one always tries for a flat a.g.c. curve, but one is then faced with the problem of providing a varying deflection on the S meter.

One solution to this problem would be to have a separate r.f. amplifier with only a limited amount of gain control so that the full scale deflection of the S meter could be controlled over a specified range of input voltage independent of actual a.g.c. range. However, this involves a lot of extra expense and is not justified by the degree of importance placed on S meter readings—hence the compromise in a.g.c. range. With a low value series resistor (22K ohms) and a high gain AY1115, signal to noise ratio for low level inputs and a similar threshold will be used on the front-end r.f. amplifier to be described in a following article.

B.F.O. AND PRODUCT DETECTOR

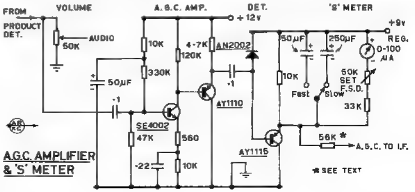
The b.f.o. is a simple Colpitts circuit which is also described by Pye as a recommended oscillator circuit. Several methods were considered for switching the two crystals without the need for two distinct oscillators. Associated with this problem is one of mechanical construction. It is desirable to keep the b.f.o. as close as practical to the product detector and yet direct crystal switching can only be achieved by building the oscillator close to the switch mechanism. An alternative to this is to provide some form of diode switching so that only a d.c. control voltage is required to perform the function. A minimum of two diodes, several resistors and by-pass capacitors would be required. This weighed up against the extra expense of one transistor for a completely separate oscillator decided the issue in favour of the latter approach. Upper and lower sidebands are selected by simply switching rail supplies to each oscillator. The outputs are commoned and drive through an emitter follower to provide isolation between the oscillator and product detector.

The product detector is similar to a balanced mixer as described by McAleer.† It is a fairly common configuration and is simple but very effective. The emitter of Q4 is tied back to the base of Q5 and similarly the emitter of Q5 is tied back to the base Q4. The collectors are commoned so that for either a b.f.o. input or a signal input, at a low level, the collector currents will cancel and the output will be zero. This is because one half acts as an inverting amplifier (common emitter) and the other as a non-inverting amplifier (common base). When both signals are present the sum and difference frequencies occur at the collectors where one is filtered out via the r.f. choke and capacitors to leave the difference frequency (audio component) at the output.

The measured output amplitude of the detector with a b.f.o. signal present is a linear function of the input level up to approximately 5 mV. p-p. With no b.f.o. signal, the output will be zero until the detector is overdriven to about 50 mV. p-p. Hence for an a.m. signal the i.f. amplifier runs at a higher gain compared to an equivalent s.s.b. signal. This is of no consequence since the system has more than adequate gain to adjust for the difference in detector efficiencies for s.s.b. and a.m. operation.

(continued on page 26)

† McAleer, H. Y., "Mixer Circuit Has Clean Output," "Electronic Industries," Oct. 1960.



A.G.C. AMPLIFIER & 'S' METER

ANTENNA-FARMING

Lightweight Yagis for 7 and 14 MHz.

A. J. C. THOMPSON, VK4AT*

THE Yagis to be described in this article are actually only one section of the experiment undertaken at this QTH in order to lift up my signals from the very bottom of the list. I was very fortunate in having two very experienced Amateurs in the persons of VK4XR and VK4LN to guide my footsteps.

The signal situation changed for the better when indicators were used on the tx and were also better understood. The same technique brought both feed-lines and antennas into line also. For the latter some different indicators had to be developed. It was just one more step to use these same indicators to subdue reluctant Yagis.

As I live in the country, text books are easier to obtain than periodicals. This may be a very doubtful advantage but at least (with antennas) you only get the subject in which you are interested and at any level that you can cope with. In the country we have an added advantage in that the Public Library will supply three books at a time for a month with the option of another month.

By sheer accident I had taken notes of formulae for Yagi construction from over a dozen different text books. I then worked these out on a 14 MHz. basis and studied the peculiar result. One of them had the characteristics that I required and it is this design (with a few necessary changes and the addition of an extra element) that is used in both Yagis here. It is the matching of the impedance at the dipole that is of importance, but in this case the addition of the extra element at such a low wavelength-height did appear to improve its performance.

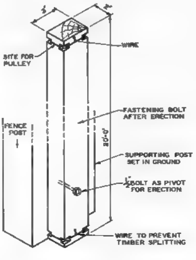
We are dealing now with practical results but the reasons for obtaining them should be stated also. In dealing with reasons, my opinions are not necessarily right even though several stated facts may suggest that they are. Another point that I wish to make is that, in the case of the Yagis mentioned here, no attempt has been made to obtain maximum gain. We have to accept all the disadvantages of this type of erection and then try for maximum gain under those conditions. Even then we accept less than that gain by easing the probable error factor. As an example, you could cut open wire line to within 1% for an electrical half-wave, but with co-ax., because of age and type, you could be 10% or more out.

During the last two years, four Yagis have been tested here. A 2 and 5 element, at one-eighth wavelength height, on 7 MHz.; and a 4 and 5 element, at one-quarter and one-eighth wavelength heights on 14 MHz. Actually spreading out sideways instead of up was the order at this QTH because of the area available. Long wires, Vees, and Rhombics failed on the shorter hauls on 7 MHz. when tested against Yagis, but on the receiver under bad QRM conditions the Rhombic was outstandingly successful. The high gain of the Yagi was usually a disaster on the receiver. At other times when QRN was localised the narrow beam was an advantage. At this QTH two different antennas are in use on the tx and rx at all times except when conditions are good.

We are apt to copy t.v. techniques even on our longer wavelengths, but actually our aims are quite different. We require only one band and can sacrifice bandwidth for extra gain. Even the diameter of the elements, 6/1000 wavelengths so suitable for bandwidth and structural strength, does nothing for us either. Even the use of longer reflectors and shorter directors is designed for extra t.v. bandwidth. Many Amateurs are denied overseas contacts on 14 MHz. because of the difficulties associated with the erection of the necessary beam, and the danger associated with such, under storm conditions.

On this antenna-farm, many different antennas have been tried out and discarded for various reasons until at present they have dwindled down to a 7 and 14 MHz. Yagis, a big Rhombic and an off-centre fed multiband of no particular merit and temperamental, too.

In industry full advantage has been taken of lightweight materials in modern structures. It is a trend that we should also follow. On any antenna-farm ease of construction and erection are very important. These factors are obviously dependent on the weight of the structure to be supported. This problem was tackled here in various ways, but mainly on feed-line techniques. Feed lines themselves of 300 ohms in Yagis used as folded dipoles have the disadvantage of requiring co-ax. at the centre. If, instead, we use 300 ohm line instead of co-ax. then the folded dipole has to have three elements instead of two.



DIAG. A.

This disadvantage was overcome in the 7 MHz. Yagi with five elements, by constructing a three-wire folded dipole spaced at distances of diameter of wire X by 6 (equal to 300 ohms for two wires). The necessary spacers were placed about 2 ft. apart. They were constructed out of 1" polystyrene piping. It is fairly rigid. This has been pulled up and down continually over 18 months and shows no ill effects and has no tendency to twist. This latter is the hardest thing to cope with in home-brew lines.

The above comments deal with the main weight problems. Nylon cord was used on two sides, using 16g. galvanised steel-wire strung between them for the elements. This cord shows no sign of deterioration after 18 months of use. This light-weight method of eliminating posts presented a lot of problems even with such a light weight to support. When strung between four posts, it still sags down and inwards too. The 7 MHz. Yagi ended up with eight posts to support five elements.

FIRST 14 MHz. YAGI

The first of the 14 MHz. Yagis will be described now. It was similar to the 7 MHz. but had a two element folded dipole and used co-ax.

The requirements were:

(1) It had to be as nearly as possible a square when complete.
(2) It should be able to be rigged on the ground.
(3) It had to be very light.
(4) It had to be easily lowered, turned, and then raised in any one of four positions quickly.

The square chosen (diagram C) had a reflector of 35 ft. but because of the impedance importance, only two of the three directors were used in this Yagi, which meant it was only 28 ft. long overall. The four supporting posts were placed 37 feet apart. The main weight problem occurred at the folded dipole portion where a fishing rod took the co-ax. weight and a sideways pull with string assisted things too. The inward pull was countered to some extent by (diagram C) where shorter leads were used on the centre elements to the nylon cord. The different heights of the elements were arranged correctly

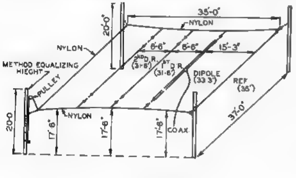
* Skyrings Creek, Pomona, Qld., 4568.

by diagram C where the higher end elements were lowered to the centre levels by means of an extra cord and this pulled outwards and spiralled down the post.

After the four supporting poles had been erected this outfit was constructed and erected by two men in an afternoon Contacts from Venezuela to Canada were later made using a Galaxy transceiver. The outfit for this band, since then, has been a Viking tx on 120w. a.m.

To assess its performance I have looked up the log book and notes of that time. It appears that I started off about 8 p.m and worked five American stations in a couple of hours, two of them being very long QSOs. During the following week at about the same time a couple of Ws were worked in short sessions each time at intervals of a couple of days. These QSOs were for the purpose of checking band conditions to see if the former session had been average. Afterwards I evidently had classed it at about average for that particular week. Being a dairy-farmer I was unable to operate at an earlier hour when band conditions are usually much better. Being on a.m., it was necessary to put the signal dead centre on an s.s.b. CQ call, so much time was wasted looking for CQ calls or the termination of a QSO

Being quite new to this particular tx and also to an overseas band made the situation worse. However, the results satisfied me that the beam itself was quite normal. A better example perhaps would be the checks against a Galaxy conducted by VK4LN. The Viking was usually about 4 points below that of the Galaxy. Checked against a Command on 60w. it is usually about one S point better. I regret that better DX figures were not obtained, but I was testing the Yagi beam, not the DX. The signal strengths given were mostly 6-8. I am fully aware, too, that the big and efficient beams over there are, by the law of reciprocity, helping us to get these reports.



DIAG C.

7 MHz. YAGI

At this QTH initial trials began on 7 MHz. with a 2 element Yagi. It was in use for about a year before I was satisfied that I understood its behaviour. Unless the Yagi's behaviour towards indicators is well understood, these same indicators will lead you well astray. I had a tuned half wave feed line on the reflector too for awhile, so everything that could happen did happen.

There is a big difference between working with a Yagi that is already correct and trying to get a Yagi to work when some factor has upset the estimated impedance values. In this case the doubtful factors are the low wavelength height and the structural components. Neither of the two 14 MHz. Yagis erected needed alterations according to the indicators, but that is just luck. To save mental tangles, the following things should be considered when reading the indicators:

(1) Up to a quarter wave space, a parasite reduces the input resistance of the driven element.
(2) Shorter directors and longer reflectors lose gain but increase the bandwidth.
(3) The input impedance of each element varies according to its position in the array.
(4) End-fire arrays (like Yagis) are less affected by the height factor than curtain arrays.
(5) The phase changes with the separation of the elements and also with the length of the parasite.
(6) The phase of the parasite current relative to that of the driven element increases with separation.
(7) The magnitude of the current in the parasite falls off rapidly as it separates from the driven element.
(8) A 2 element beam can both be driven, but if we detune the reflector its resonant frequency would approach that of the driven element to the point when equal currents would exist. If the process was still continued it would become a director.

From the above you can see all the things that would occur when I tuned the reflector. At the same time, because of its position, the reflector has least effect on the other elements if the spacing is used to alter the impedance value of the dipole. It must be remembered, however, that the spacing has to be such that the impedance at the dipole is right. In this case it is 16 ohms which is 16 x 4 for a folded dipole. The gain is 11 db. Gain must be sacrificed for correct impedance. The maximum gain occurs at about 0.14 wavelength spacing for the director and about 0.17 for the reflector.

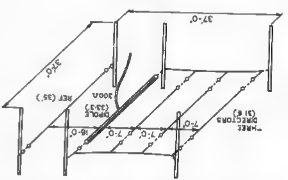
For indicators, two factors upset them:

(1) Phase changes are linked with the beam direction.
(2) A parasite approaching the driven element would register more current in its own indicator but the output would probably be l[illegible]

LATEST 14 MHz. YAGI

Finally, I will describe the present 14 MHz. Yagi built on a more permanent basis with two extra poles to overcome the sagging properties of the former one. This one was designed to test (1) lighter structural supports, (2) the effect of one-eighth wavelength height instead of one-quarter. Diagram D shows the position of the six poles required, two each being for the reflector, dipole and the end director. Under these circumstances the two remaining directors (this was changed to five elements) were strung on nylon cord, then the ends of which were attached to the dipole and end director posts respectively. The spacings were slightly altered to fit the 37 ft. apart poles. The main defects of the more mobile beam were overcome and the elements were aligned with greater ease. (Diagram D).

DIAG. D



The disadvantage of reducing the wavelength height to one-eighth wavelength was evident on both the 7 MHz. and 14 MHz. beams. Forward gain was lost but the beam appeared to be much wider. This was quite acceptable on 7 MHz. owing to my geographical position in respect to both Brisbane and the Southern States, but on 14 MHz. I gained JAs at the expense of Ws. It should be noted also that slightly increased spacings of the elements were used on 14 MHz for this test.

I trust that this information will be sufficient to start experimenters looking at these light-weight structures and asking themselves if big heights and 100% efficiency are always necessary.

It should be noted that the biggest jump-up in signal strength occurred with the addition of a reflector to a dipole. Owing to the error factor there is more chance of obtaining the 5 db. gain with these two elements than the 11 db. gain with the present Yagi.

FET Conversion of Leader LSG11 Signal Generator

JOHN MEYLAND, VK3AJM, and JOHN BROUGH-SMYTH,† VK3ZBW*

An article describing conversion of Signal Generators to all FET operation by John Beckett, VK3FE, and appearing in the Eastern and Mountain District Radio Club Bulletin (VK3) recently prompted the writers to try out their ideas on their Leader LSG11 units, and as the results were more than satisfactory on the units converted it was decided to write them up and pass them on, as the ubiquitous LSG11 seems to figure prominently in most Amateur shacks visited by the writers.

It is stressed that ideas were arrived at in a rather hit and miss approach, and doubtless there are many other modifications that can be made such as varicap fine tuning, further reduction on the dial drive, etc.; these we will leave to the individual. The mods as follow can be done with parts readily obtainable through the W.I.A. components sales department.

1. Remove all wiring and components from a.c. mains lead to R13 and C15 inclusive. Remove all heater wiring, by-passes, dial light.

2. Remove valves from sockets. Obtain a 7-pin and a 9-pin plug that will plug into the existing valve sockets. These are used to mount the FETs.

3. 12BH7 socket. Carefully solder with suitable heat sinking a 2N3819 FET. Drain to pin 6, gate pin 7, source pin 8 to the 9-pin plug (pin numbers as seen from underneath). Solder another 2N3819 or an MPF102: drain to pin 1, gate pin 2, source pin 3.

Note: The 2N3819 and MPF102 have different base connections. Incidentally, we couldn't make an MPF102 function as an oscillator in this circuit.

4. 6AR5 socket. Solder an MPF102 to the 7-pin plug: drain to pin 5 or 6, gate pin 1, source pin 2.

5. Remove R2 (5K) and replace with 1K ½ watt.

6. By-pass R4 (300 ohms) with 100 μF. 3 volt electrolytic for a.f. and also 0.001 μF. for r.f.

7. Reduce C14 (output coupling) to 68 or 100 pF.

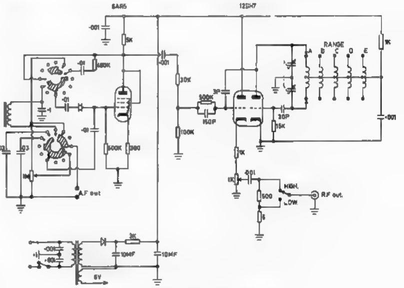
8. Mount a 9 volt battery in the case, ground negative lead and wire positive to one side of the switch on VR1. Wire the other switch terminal direct to the h.t. rail.

9. Wire a 0.001 μF. ceramic by-pass across audio terminals.

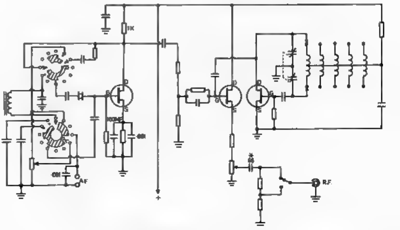
Without further modification you now should have a FETised signal generator capable of performing all the functions the valve version will do, but with vastly increased stability and, as a most significant improvement, the elimination of signal radiation which has been escaping by the a.c. mains lead. This leakage in the valve versions has made level attenuation almost impossible in the higher frequency bands.

We almost forgot to mention, the units are completely portable in this modified form and there is no warm-up period required. Battery current has been measured at 8½ mA., so replacement should be infrequent with intermittent use.

* 29 Hardisty St., Wangaratta, Vic., 3677.
† 88A Phillipson St., Wangaratta, Vic., 3677.



Original Leader LSG11 circuit.



Modified circuit of Leader LSG11.

The History of Amateur Radio and the Wireless Institute of Australia

By G. MAXWELL HULL,* VK3ZS

● The story of Amateur Radio and of the Wireless Institute of Australia—the Society which has represented it for 60 years—is indeed a fascinating one: a story depicting man's involvement in and advancement of a technical art which at its inception was a formidable investigation of the mysterious and unknown world of electromagnetic energy.

1970, the Anniversary Year of Captain Cook's early discovery of the east coast of Australia 200 years ago, before the birth of electricity, seems a fitting time to write the history of Amateur Radio and the Wireless Institute of Australia.

The historical records of Amateur Wireless Experimenters is far from complete in the early years, for so much was done by so few in the remoteness of home workshops and of which little or no publicity was given, that records of these activities—if such were ever recorded—have been lost over the many years.

What information is available, however, makes for a fascinating story. The series of articles commencing in this issue of "Amateur Radio" magazine, therefore, is an attempt to record for posterity the romantic history of Amateur Wireless, commencing before the turn of the century and concluding in 1970.

From this period of 60 years will be recorded the true facts available from these records, of the early electrical experimenters to the birth of radio transmission and reception, of the men who made Amateur Radio a "living thing" and paved the way for commercial broadcasting and communications, of the Wireless Institute of Australia and other Clubs and Societies who protected portions of the frequency spectrum for the continued use of future experimenters and hobbyists, and of all the activities originated and perpetuated by the Wireless Institute of Australia in maintaining Amateur Radio as a vital sociological and technological pursuit for mankind in Australia and in those countries which countenanced its use.

THE story of Amateur Radio, as far as Australia is concerned, commences in the year 1901, and that of the Wireless Institute of Australia in 1910. This extraordinarily romantic story would never have been possible had it not been for amateur and professional electrical experimenters, predominantly in the nineteenth century, but also as far back as the eighteenth century.

The Institution of Radio Engineers of Australia (I.R.E.)—now known as the Institute of Radio and Electronic Engineers (I.R.E.E.)—in celebrating Radio Foundation Day in 1936, fixed 12th December, 1901, as the birthday of radio—the marvel and mystery of the wonderful twentieth century.

In writing this history it would therefore seem in order to take the reader back briefly to this early period of "electrical discovery" which in retrospect led so naturally to the development of "wireless" as it was termed, and from which the Wireless Institute of Australia derived its name.

EARLY ELECTRICAL EXPERIMENTERS

One merely has to look again at basic theory to bring to mind many of the names of early electrical experimenters; names such as Franklin, Coulomb, Volta, Oersted, Ohm, Faraday, Morse, Henry, Joule, Maxwell, Hertz, Fleming, Ampere, Edison, Bell, Kelvin, Galvani, and many others later on, whose names became attached to electrical terms, laws and inventions.

Benjamin Franklin (1706-1790) was an amateur experimenter with electricity, inter alia, in the eighteenth century. He conducted his most famous experiment at Philadelphia (U.S.A.) in 1752 by flying a home-made kite during a thunder storm, proving by the discharge of sparks from a key attached to the ground end of the kite-wire that lightning was electricity. It is generally agreed by early authorities that Franklin created the electrical terms—armature, condenser and battery.

The French physicist and engineer, Charles Augustin de Coulomb (1736-1806), who as a French aristocrat fortunately escaped the guillotine of the tempestuous years of the French Revolution, can be stated as having first investigated electrical and magnetic measurement during his invention of the torsion balance for measuring electrical attraction. His name became attached to the practical unit of quantity of electricity, being the quantity conveyed by a current of one ampere in one second. His contribution placed the twin sciences of electricity and magnetism on what today we call a "quantitative" basis, that is to say on a basis of firm and indisputable measurement. This provided a sound foundation for those learned experimenters of later years. Amongst other electrical terms, amateur wireless experimenters had to learn and understand the meaning of the term "Coulomb".

The advancement of the science of electricity and magnetism was not always strictly confined to the electrical experimenter. For instance, Luigi Galvani (1737-1798)—an Italian physiologist and anatomist born at Bologna—made various experiments and studied the effects of electricity upon the nervous and muscular systems of frogs, during which he invented a metallic arc, composed of two metals, which, when placed in contact with the nerve and muscle of a frog respectively, caused the latter to contract. He wrongly concluded that the frog's legs contained electricity that was released when the legs touched metal. What we know now is that the electric current was produced by chemical action. For a long time, however, people referred to electric current as "Galvanic Current", thus Galvani's name became attached to the galvanic battery, galvanic pile, galvanometers and the process of galvanising. The word "galvanism" was derived from his name which any dictionary gives as being—electricity produced by chemical action, the branch of physics dealing with this and the use of such electricity for medical purposes.

Not long after Coulomb came an Italian physicist and philosopher by the name of Count Alessandro Volta (1745-1827) who similarly carried out experiments with static and current electricity. He invented the electrophore in 1775 and an electrical condenser in 1782. It was Volta who discovered why Galvani's frogs legs twitched when he learned that the chemical action of moisture and two different metals, such as the copper and iron used by Galvani, produced electricity. He made the first battery, called the "voltaic pile", and the earliest absolute electrometer, both of which brought him great fame. The unit of electromotive force (volt) was named after him.

So far, it seems, these early experiments were concerned with electric "voltage" and electric "current" as different but related units. It was Hans Christian Oersted (1777-1851), a Danish scientist, who first discovered the "electromagnetic" relationship in 1819 by observing that a current flowing through a wire would make a compass needle move, thereby proving that an electric current has a magnetic effect. In the same year, the French mathematician and physicist, Andre Marie Ampere (1775-1836), born in Lyon, also discovered electromagnetism. He showed that parallel electric currents attract each other if they move in the same direction and repel if their directions are opposite. His mathematical theory describing this phenomena provided the foundation for the development of electrodynamics. He also discovered that an electric current flowing through a coiled wire acts like a magnet, and this led to the invention of the galvanometer (to which Galvani's name was attached), an instrument for detecting and measuring electric currents. By 1822, Ampere had worked out the laws that formed the basis for the science of current electricity and so the unit of current became known as "the Amp" or "Ampere".

Around the same period, 1826 to be precise, George Simon Ohm (1787-1854), a German school teacher and physicist born at Erlangen, formulated the law of electrical resistance, which

* 22 Dryden Street, Canterbury, Vic., 3126.

bears his name. Ohm's Law was the most important law in electricity which in its original simple explanation said: "The strength of the current in a circuit varies directly as the electromotive force and inversely as the resistance of the circuit". On this law rested the future development of the science which otherwise would have been greatly retarded.

In this same decade, the well known English chemist, electrician, and natural philosopher, Michael Faraday (1791-1867), was studying the effects of electromagnetism, amongst other things. Born at Newington, London, the son of a blacksmith, his work was widely diversified from chemical research, electricity and magnetism to the manufacture of glass for optical purposes. His most famous discovery, which was to have far reaching effects, was electromagnetic induction. He had rightly believed that if electricity could produce magnetism, then magnetism could produce electricity, and he proved this theory in 1831 when he discovered that moving a magnet in a coil of wire caused an electric current to flow in the coil.

Almost every year, except for three years of bad health (1841-1844), saw some remarkable discovery by Faraday in connection with magnetism and electricity. Amongst the most important were: the identity of electricity from different sources (1833); electro-chemical decomposition (1834); the relation of electric and magnetic forces (1838); magnetic rotary polarisation (1845); diamagnetism (1846); and polarity of diamagnetics and the relation of diamagnetism to crystalline forces (1849). It was said of Faraday that his lucidity, his experimental skill and the natural charm of his manner combined to make him extraordinarily successful as a lecturer. Many of these early experimenters delivered lectures and wrote papers and books on their discoveries and this much of the knowledge became available to others.

Born in Charlestown, Massachusetts, U.S.A., in the same year as Michael Faraday was a man whose name will never be forgotten—Samuel Finley Breese Morse (1791-1872), famous for his invention of the electric telegraph and the Morse code, the latter becoming the code universally used throughout the world in the early telegraph days and remaining a "natural" for communication by wireless when it eventually became a commercial proposition. The Morse code was the basis upon which communication could take place between nations irrespective of language barriers and it has remained so as a sociological aspect of Amateur Radio communication.

Not unimportant, too, was the telegraphic side of Morse's work. First as President of the National School of Design in the U.S.A. (1826) and as Professor of Design at the University of New York City (1835), he devoted considerable time to the experimental field of electric and galvanic research, which resulted in the development of high quality electromagnets so widely used in the telegraph and telephone systems of the world, and which, of course, found a wide use as "relays" as the science of wireless progressed later on.

Seven years after Michael Faraday and Samuel Morse were born, came Joseph Henry (1798-1878), an American born at Albany, New York, who was to become a great scientist and mathematician. Independently in 1831, at the same time as Faraday, Henry had also discovered that magnetic energy could be transformed into electrical energy. They both had found, in fact, that currents would be caused to flow in a closed conducting loop if the average intensity of the magnetic field passing through that loop was changed. The current so induced in the loop would flow only while such change was taking place, its strength would be proportional to the rate of change, and its direction would depend on the direction of the field and whether it was increasing or decreasing. It mattered not whether the change in the number of magnetic lines passing through the loop was caused by changes in the field itself or by a movement of the loop with respect to the field or by a movement of the field with respect to the loop. These laws of electro-magnetic induction directly paved the way for the electric dynamo, just as the converse laws had paved the way for the electric motor.

Joseph Henry did a lot of work with electromagnets; large magnets of great lifting power, and small powerful so-called "intensity" magnets. He was first to actually magnetise iron at a distance and at one stage in history controversy arose between Henry and Morse as to who actually invented the electric telegraph. However, there seems no doubt that the honors went to Morse. The name of Henry was attached to the electrical term "inductance" which was to play such a vital role in the later development of wireless.

Another eminent English physicist was James Prescott Joule (1818-1889). His early work which played such an important part in later electrical development was on magnetism; particularly, again, the magnetisability of iron by electric currents, a research which led to a definition of a practical unit of current. He stated a law (now called Joule's Law) that heat is produced in an electrical conductor. The unit of energy, used to measure the amount of work done, was named in his honor. It is equal to the energy needed to send an electric current of one ampere through a circuit of one ohm resistance. In the United States of America in 1894, an act of Congress made the Joule a legal unit. It was too small for commercial measurement, so kilowatt hours was used instead. Joule shared in discovering the law of the conservation of energy which states that: "energy used up in one form re-appears in another and is never lost". Two German physicists, Hermann Helmholtz and Julius von Mayer, and the British physicist, Lord Kelvin, also worked on the law.

THE EMERGENCE OF WIRELESS

With all this knowledge available from the developments by the aforementioned experimenters, and many others too numerous to mention in detail in this brief reference, it was not surprising that the nineteenth century saw the commercial development of the electric light, the telegraph, the telephone, the electric bell, electric motors which of course brought about electric traction, the generator, the alternator, and many other electrical devices.

It is also not surprising, therefore, that towards the end of the century emerged the greatest development of all — electromagnetic wave propagation. Into the electrical scene came James Clark Maxwell (1831-1879), the Scottish physicist born in Edinburgh. His principal researches were into the composition and vision of color, the kinetic theory of gases, and electricity and magnetism. Upon Maxwell's theory of electromagnetic wave propagation was based his electromagnetic theory of light. But a little before Maxwell developed his profound theories some remarkable experiments on electric waves had been carried out by the German experimenter, Heinrich Rudolf Hertz (1857-1894), who had received his final training in experimental and mathematical physics in Berlin under Hermann Helmholtz. It was Hertz's experiments which formed the central feature of Maxwell's profound theory. And so we again observe the interlacing of these early imporant developments because of the knowledge being available to many experimenters.

However, the experimental proof of Maxwell's theorem can assuredly be credited to Hertz who produced very rapidly oscillating electric currents by means of sparks between the plates of a condenser. Although these oscillations were said at the time to be rapid, we know today that they were comparatively slow (low frequency and long wavelength). His guiding principle was resonance. Kelvin had shown earlier under what conditions an electrical discharge was oscillatory in character, and Hertz showed how to make an instrument in tune with this oscillation.

Having proved the existence of electric waves propagated through space, he went on to show that they could be reflected, refracted, polarised and diffracted, just as light is. He measured the velocity of propagation and found it to be of the same order as that of light and radiant heat. The practical development of the experimental facts established by Hertz was wireless telegraphy, and from this point of view his discoveries rank with Faraday's and Henry's discovery of electromagnetic induction. More recently his name replaced the electrical term "cycle per second" to denote frequency.

And so a stage was reached close to the turn of the century where a vast amount of electrical phenomena had been discovered and put to use in the practical sense but no one had found a practical use precisely for the electromagnetic propagation discoveries of the day. It was to be an Italian born electrical engineer, Guglielmo Marconi (1874-1937), who was to set the stage for the practical use of wireless transmission and reception which led to present-day radio broadcasting and

global communication in which Radio Amateurs played such an important part.

Marconi is often referred to as "the inventor of wireless", but of course he wasn't really as the reader will understand from what has been said already. But he was a clever inventor and engineer who saw the practical application and did something about it. His first experiments were made in Italy in 1895, then put to practical use in England in 1896 because the Italian government took no interest in what he was doing.

He applied for and received from the British government the first wireless patent, the famous No. 7777. The patent was based in part on the theory that the distance of communication increases rapidly as the height of aerials is increased.

In 1897 Marconi formed the first wireless company which installed wireless sets in lighthouses along the English coast. He sent the first wireless telegraphic message across the English Channel, a distance of 85 miles, in March 1899. He spanned the Atlantic from a sending station at Poldhu, Cornwall, England, to a receiving station at St. John's in Newfoundland in 1901, and from Canada to Newfoundland in 1902. The signal was the letter "S" sent in Morse code. Marconi made many advances and took out many patents in the commercial field of wireless before he died in 1937. His work brought him honors from governments throughout the world. The Italian government made him a senator of the kingdom of Italy for life in 1909, and he received the hereditary title of Marquis in 1929. He always considered himself an amateur.

THE ENTRY OF AMATEUR WIRELESS EXPERIMENTERS

The final practical application of Hertzian waves by Marconi just before the turn of the century must surely have been the most exciting period of scientific investigation the world had known. It certainly had been exciting enough for purely amateur experimenters to have closely followed the course of events for there is ample evidence, although not a lot of precise history available, to show that Marconi was not the only one to have developed equipment with which to transmit and receive electromagnetic waves, which we now know as radio frequency energy, although he undeniably was the first to do so commercially. All over the world in countries where great learning had evolved, the man-on-the-street as well as the qualified engineer was interesting himself in the marvellous and mysterious wireless, duplicating what had already been done and experimenting with new ideas based on the available technical knowledge. Amateur Wireless was born! It heralded a new race of human beings who rapidly became known around the world as Radio Amateurs or "Hams" and whose exploits, experimenting, and contributions to the progress of the science has made history ever since.

Around the turn of the century Australia was not behind in producing a few keen amateur experimenters whose curiosity, initiative and determination set the stage not only for Amateur Radio as we know it today but also for medium and short wave broadcasting.

As far back as the year 1896, G. W. Selby, of Malvern, Victoria, was already exploiting the great subject, and he exchanged correspondence with the British physicist, Sir Oliver Lodge, who at that time was evincing keen interest in the new marvel of science. Also before the year 1900 Professor W. C. Kernot and Messrs. H. W. Jenvey and F. W Chambers, of the Victorian Postal Department, were experimenting in the same direction.

In 1901, at the same time as Marconi was making his epic trans-Atlantic transmissions, Walter Jenvey (the father of Bill Jenvey, VK2ZO), was operating his own experimental wireless station at Red Bluff, near Elwood, Victoria, under the call sign RB. Walter Jenvey was then the Chief Electrical Engineer to the Victorian Post Office and according to the Melbourne "Argus" newspaper of the 11th April, 1901, he had forwarded the following report to Mr. F. L. Outtrim, the permanent head of the Postal Department:

> "I beg to report that during the Easter holidays I conducted a series of experiments in wireless telegraphy. By kind permission of Mr. G. Chirnside, I was enabled to establish a station at Point Cook, near Werribee, and the results surpassed my expectations. Messages were exchanged between Point Cook and Point Ormond (the Red Bluff), a distance of 10 miles in a direct line, the signals being first-class. As no mast was available, we flew a kite which served admirably. I think there would have not been any difficulty in transmitting messages over 20 miles. If the government desired it, a station could be established at Point Lonsdale for the purpose of welcoming the Duke and Duchess of Cornwall and York whilst the S.S. 'Ophir' is still 20 miles or more from the shore."

The records show that the government took notice of his suggestion and he was requested to establish the station at Queenscliff on the western head of the entrance to Port Phillip Bay. The S.S. "Ophir", as it transpired, did not carry wireless but the H.M.S. "St. George", the escorting cruiser, was so fitted and two-way communication with Queenscliff and later Red Bluff was carried out up to 30 miles. This is, so far as is known, the first recorded occasion of wireless communication between shore and ship from Australia and a Rock Cairn was set up to mark the site from which the transmission took place. The visit of the Duke and Duchess of Cornwall and York marked the occasion of the first Federal Parliament in Australia. The coherer detectors used for receiving the messages between the H.M.S. "St. George" and Jenvey's land station were attached to operate Morse tape-inkers and much of this historic ship-to-shore communication is preserved in the Museum of Applied Science, Melbourne.

After leaving Melbourne, the S.S. "Ophir", accompanied by H.M.S. "St. George" and H.M.S. "Juno", proceeded to Hobart, Tasmania, where Mr. Hallam, a telegraphist engineer of the Postal Department, assisted by "Pop" Medhurst, ZXD (VK7AH), made W/T contact with H.M.S "St. George" from the then defence battery on One Tree Point at the Long Beach Light, better known as "Blinking Billy".

In Manchester (England) in 1936 the eminent British physicist, Professor W. C. Bragg, described to a gathering of people the work of his grandfather, Sir Charles Todd, in the sending of the first wireless messages to Australia, and of his own assistance in the project. Sir Charles Todd was South Australia's first postal chief in 1901 and was responsible for the great work of constructing the overland telegraph from Adelaide to Darwin. He was already an old man when the first whisperings of Marconi's wireless were heard around the world, but his imagination was deeply stirred. A wireless installation was fixed near Adelaide between two stations two miles apart and signals were successfully broadcasted.

Another series of early experimental transmissions were carried out at St. Stanislaus College, Bathurst, New South Wales, in 1904. Father Slattery was the amateur experimenter and his first tests were conducted in the College grounds where he transmitted to receiving equipment operated by Father O'Reilly, assisted by a Mr. John King. Encouraged by his success, he then transmitted to the tower of St. Michael and St. John's Cathedral, a distance of three-quarters of a mile, and then from the College to the Catholic Presbytery at Kelso, over three miles, where the signals were received by Father O'Reilly and Father Flanagan. Brief details of these transmissions are contained in the College records and the equipment is still there, preserved in good condition.

By 1905 there were quite a large number of experimenters throughout the world. In Australia the Wireless Telegraphy Act came into force requiring experimenters to apply for experimental permits for receiving purposes. Most of the commercial equipment in existence at this time was concerned with the naval, lighthouse and marine services around the world. As far as England and Australia were concerned, authority for its use was vested under control of the Navy. It was not surprising, therefore, that the Admiralty raised early objections when in 1908 Messrs. C. P. Bartholomew and W. H. Hannan, of N.S.W., and R. Sutton, of Victoria, applied for experimental licences to transmit. The matter was referred to the Crown Law Department under whose guidance a suitable licence form was produced and the problem with the Admiralty was apparently overcome. 1908 also saw the first Handbook on wireless transmission and reception.

There is some doubt that all experimenters took out licences, for records indicate a larger number of active spark coil transmitters on the air than licences issued. The commercial transmitters used various systems—Marconi, Shaw, Telefunken, and Lodge-Muirhead to name a few. Amateur experimenters used adaptations of some of these Spark

systems were basically of two main types—the fixed spark and the rotary spark. The rotary spark was probably too costly for amateur experimenters since it required power—either engine or electric motor—to drive a very high voltage alternator. The fixed spark was more easily produced and the historically most common one used by amateur experimenters was the old Ford Model T spark coil, the operating key being connected in the six-volt d.c. winding of the device.

Up to and during the 1914-18 World War, the wavelengths of the spark transmissions were from several thousand metres down to 600 metres or so, the term "frequency" being adopted at a much later date. Short waves as yet had not been discovered, the amateur experimenter being destined to achieve this. The valve had not been developed for commercial use although Fleming had developed the first thermionic valve—called the Ionised Gas Detector (Diode)—in 1904.

Two years later (1906) the American inventor, Lee de Forest, inserted the grid, thus producing the first valve capable of amplification, which became known as the Audion or Triode. By 1913, Lee de Forest, together with Langmuir, Hogan and Meissner, introduced the principle of self-oscillation and regenerative amplification using the triode valve which was to have far reaching effects along with other important developments in finally sounding the death knell to the old spark transmissions although a few old marine transmitters continued to bark out their "rock crusher" signals well into the first half of the century. Chaw-chitty-chaw-chitty-chaw-chaw was one expressive way by which these signals were described!

The receivers employed coherer detectors consisting of filings which were caused to cohere by the incoming signal and de-cohere upon the receipt of vibrations from a buzzer or bell. Later, the electrolytic detector was developed. This used the principle of electrolysis whereby a small battery shunted across a large and a small set of electrodes decomposed a dilute solution of sulphuric acid, forming hydrogen on the smaller electrode (which was usually a needle point), having the effect of polarising the cell which stopped current flow through the telephones connected in series with the battery. When a train of oscillations passed through the cell, it acted in a manner opposite to the cell and depolarised it, thereby allowing a current to flow to produce an audible signal.

Then came one of the most ingenious detectors, invented by Marconi, called the magnetic detector. It utilised a magnetic band of iron tape which, driven by a clockwork motor, slowly moved past two horseshoe magnets in the field of which was a primary and secondary winding through the middle of which the iron band passed. When a train of waves passed through the low resistance primary winding, the iron tape (continuously rotating) was always coming under the influence of the first horseshoe magnet. It was reasoned that the train of waves had the effect of destroying the hysterisis of the iron just before the tape reached the field of the second horseshoe magnet which restored the molecules of the iron. This action caused a rapid magnetic change, thus causing a change in the lines of force induced in the primary winding which in turn caused an audible signal when a pair of telephones were connected across the higher resistance of the secondary winding. In modern jargon, we would term this the primary and secondary impedance of a small audio transformer in which the iron tape formed the magnetic core. One cannot help but observe in this device the basis for the evolution of the magnetic tape recorder.

Badge of the Amateur Wireless Society of Victoria struck 1909.

Most of the detectors of the day were discontinued after the first World War with the exception of the well known crystal or galena detector, which continued in use for many years. The various materials used, galena being a common one, had the natural ability to pass a current in one direction but not in the reverse direction, in other words it was diode rectification. When a train of waves reached the detector, one half cycle was able to pass and the opposite half cycle was blocked, thus again an audio signal was produced in a pair of telephones. Today we use solid state diodes to do the same thing. The earlier type used an adjustable "catswhisker" to locate a sensitive spot whereas the modern diode of a suitable type has a constant sensitivity.

In 1970 it is difficult to imagine what wireless was really like in these early days. Ten-year-old school boys today can learn, understand and readily construct quite sophisticated equipment with little difficulty and they have available to them individual and complicated components with which to do so. But in the period we are talking of there were very few commercial components available although it was not many years before the business man grasped the opportunity of supplying such components. They were, however, quite expensive by the economic standards of the day and amateur experimenters largely used their ingenuity and applied mechanical skill to construct their own components, from winding their own inductances, chokes and transformers to manufacturing an assortment of mechanical contrivances.

BIRTH OF THE WIRELESS INSTITUTE OF AUSTRALIA

People in all walks of life who have a common interest also have a desire to congregate together and amateur experimenters were no exception. And so it was, in 1909, history records the fact of a group of Victorian Amateurs who gathered together to form the Wireless Institute of Victoria. In the same year another group formed the Amateur Wireless Society of Victoria. The former society held their meetings in Oxford Chambers (now demolished), Bourke Street, Melbourne, and the latter held their meetings in an upstairs room of P. H. McElroy's premises in Swanston Street, Melbourne, later occupied by Homecrafts Pty. Ltd. Both these organisations struck badges which are illustrated herein, and as far as is known, were the only ones to do so.

In 1910 the members of the Amateur Wireless Society of Victoria disbanded their club and joined forces with the Wireless Institute of Victoria. In the same year a group of experimenters formed the Wireless Institute of New South Wales. The members of both these Institutes, recognising the value of banding together to share and advance their common interests, expanded their activities to form the Wireless Institute of Australia, and whilst remaining autonomous, became the first national amateur radio society in the world.

In 1913 a group of Western Australian amateur experimenters met for the purpose of forming a wireless telegraph club. It became known as the W.A. Radio Club which held its meetings in the science room at the Perth Boys' School. A branch of the club was formed in the same year at Kalo, Western Australia. By June 1914, it was decided to expand the scope of the club's activities and its name was changed to the W.A. Institute of Radio and Scientific Experimenters.

The fever of wireless transmitting spread all over the Commonwealth and in many other countries. In Australia many other clubs and associations were formed of which there is no record other than vague references. But the outcome was a tremendous development of brotherhood between people whose interest was a common one. Little did they realise that as 1914 approached, the world would be en-

(continued on page 30)

The first known Wireless Institute badge struck for a group of Victorian Experimenters who formed the Wireless Institute of Victoria in 1909

Overseas Magazine Review

Compiled by Syd Clark, VK3ASC

"BREAK-IN"

November 1969—

VHF AM Transistor Transmitter, by L. M. Cash. Reprinted from Mullard "Technical Communications," Jan. 1968. Transmitter gives 7w out on 156-174 MHz. Conversion to 144 MHz. relatively simple.

Bread-Boarding a Transistor Resonance Indicator, ZL2BEV.

Receiving Amateur T.V., ZL3TAR.

Microphone Amplifier, ZL1AZN. Three transistors and a small 9v battery.

Demonstration Power Supply, ZL1TGB. Used to demonstrate power supply theory and the characteristics of a diode and a triode.

Soldering for the Beginner, ZL3TJK and ZL2BFR. Help for the beginner.

December 1969—

My Experience with the HRH Delta Loop, ZL2AFZ. The "QST" articles made the writer think for a moment that the delta loop was an easily built version of the Quad and so it might be for 15 OR 10 metres. It is rather ungainly for twenty and so far no one has come up with suggestions for tri-banding.

Quartz Crystal Oscillators, ZL3NH.

Why Crystals Work at Two Frequencies, by ZL3ON.

ATV No. 2, ZL2TAR. The second in his series on Amateur t.v.

The Novice Radio Training Scheme, ZL3TJK and ZL2BFR. A low voltage transistor regulated power supply is described.

"CQ"

November 1969—

"Propagation Special"—the sign in large letters on the front says.

Shortwave Radio and the Ionosphere, W3ASK and Stanley Leinwall.

Optimising Short Wave Communications, by W3ASK and Stanley Leinwall.

Don't be Afraid of the Big Bad Blackout, W2EEY. Sunspots, etc.

VHF Ionospheric Propagation, W3ASK, etc.

A Sunspot Story Cycle 20: The Declining Years, W3ASK, etc.

A Seven Year Propagation Forecast for the Amateur DX Bands, W3ASK, etc.

Interstellar DX, K5BW.

"CQ" Reviews the "Swan Mode 260 Cygnet". Wilf W2AEF says that it is good money's worth. There is now a Model 270 on the market which is the de luxe version and which costs about another 100 dollars in the U.S.A.

December 1969—

Field Effect Transistors, GW3NJY. This two part article describes the basic field effect transistor and the newer, more advanced types. Part 1 covers the JFET, MOSFET and the various modes of operation. Part 2 will cover the device characteristics, biasing, dual gate FETs and circuitry.

Design for a Solid State Regulated Power Supply, ZL2BDB. Some very interesting information of power supply design.

A Monitor for the 50-54 MHz. Band, W2SI. One modified small transistor radio and there you are.

Applications of Information Theory to Slow Scan Television, WA7MKA.

Convert your Old Novice Rig to 160, by WA0ATT. Those small a.m. jobs are still useful on this band. Watch that coil. I suggest the wires do not touch where they are shown as crossing otherwise no inductance.

Antenna Adjustment, the Easy Way, by WA1HDP. To save the heart from all that ladder climbing.

"CQ" **Reviews the Collins S Line**, W2AEF. Wilf is of the opinion that there is no substitute for quality when it comes to getting satisfaction from a product. We should all buy the very best we can afford. So far as manufactured products are concerned, the good last longer than the poor.

FSK for the Transceiver, W9TKR. A small unit for adding to a v.f.o.

Australis Oscar 5. Progress Report, K8VTR/3.

The Transistor Screen Switch, WA9FDQ. Takes the place of that old clamp tube circuit.

Surplus. Eliot White describes the circuit and operation of the LM series Frequency Meters used by the U.S. Navy during the last war. Similar to the Army BC-221 (SCR-211) series. Operation was from a.c.

"OHM"—The Oriental Ham Magazine

December 1969—

DX pedition. Spratly Island. The story of a boat trip to Spratly Island, 26th-29th Jan. The VS6 operators operated on h.f. bands from 80-10 metres using an FT200.

Standing Waves: Why?, KR6JT. A discussion on this interesting subject.

CQWW (Phone). Operational patterns. Graphical records of activity of three Asian stations in the 1969 CQWW Phone Contest.

Ham Profile, CR9AK. Rare DX. Fern is Deputy Postmaster and Chief of Technical Services in the small Portuguese colony of Macao.

Reciprocal Operating Agreements, HS3AL.

The Oriental Ham Magazine will be sent to subscribers outside Hong Kong by surface mail for $US2.00 per year. Postage by air can be arranged.

"QST"

December 1969—

In Line R.F. Power Metering, W1CER. Several commercial versions are discussed and a similar home-built type is described in detail. These units are not frequency sensitive like the older Monimatch type.

Let's Talk Transistors, Part 2. Crystals, donors, acceptors and holes.

Modernising a Classic 1296 MHz. Converter, WB2EGZ. Simplification through solid state design.

Some Common Questions and Their Answers, W1ICP. Specially for beginners.

MOSFETs for Tubes, K2BLA. By using an external power supply or the bias voltage developed in the cathode circuit, it is possible to modify an older receiver stage by stage beginning at the r.f. amplifier.

A Phone Patch for the Collins S-Line, by W1KLK. Also stated to work with equipment of similar purpose from other makers.

A Tri-band Vertical Antenna, OD5CG. Three band matching without traps.

Sideband from a Suitcase, WB6IZF. This Amateur apparently travels a lot in other people's cars and has developed a way of Hamming without the car showing it has been got at.

A Power Supply for that Big Linear, W1CER. 3 kV., 1 amp., 117/234v.

The Band Divider Beam Antenna, W6TYG and W4TDI. For 7 MHz., non rotatable.

Recent Equipment. The Drake L-4B Linear Amplifier is reviewed.

Proposed Experiments with Australis Oscar 5, K8VTR/3. Another article by the same author also appears in December "CQ".

Navassar Revisited, W4QCW. Another DX-pedition story.

"RADIO COMMUNICATION"

November 1969—

A 432 MHz. Single Sideband Transmitter, Part 2, G2AIH. Continuing the description begun in the October issue. Detailed description including the "metal bashing".

Technical Topics, G3VA's regular feature. Many VK Amateurs would gain from reading the preamble to Pat's technical discussion. Tolerance is the watch-word. He strongly stresses the point that the "NEW" product is not necessarily better. Discussion follows on diode attenuators, long delayed echoes, direct conversion 14 MHz. s.s.b. receiver, and VXOs for v.h.f. A screen regulated linear amplifier is also described.

"RADIO ZS"

October 1969—

The LM Special, ZS6AOU. A transistorised receiver for use in mobile work on the 160, 80 and 40 metre bands.

A Thirty Five Foot Tower, ZS6BFW. Yes, he means tower, it is self supporting. The author states that a tower "kit" would have cost him R150, he baulked at this and rang a firm of metal merchants who gladly supplied him with all the material to build one for R35. Comment. Should support a tri-band Quad.

An Efficient Kite, ZS6PA. Seems the best 160 metre DX is to be had using kites or balloons. Some also say that if the wind is in the right direction they are very good for putting a fishing line out beyond the breakers. Ham Radio truly uses many techniques.

The Caravanner, ZS6KO. This small transmitter is of hybrid design, runs 12-15 watts input and takes 5 a. from a 12v battery. Final and modulator use instant heating QQC04/15 valves and the heating up time is only about one second.

Some Aids for Radio Hams, Prof. Shroe Luse. Humorous type article.

Mobile Antenna Mount, ZS6ET. Some of you may have seen those expensive Webster type ball mounts about. This article tells you how to make one for next to nothing if you are expert on a lathe and have a ball turning attachment.

December 1969—

Continuously Adjustable Fully Regulated Power Supply, ZS5HF. 0-15 volts at up to 1 amp. Ripple is extremely low at less than 20 mV.

D.F. Hunting, the Pretoria Way, ZS6AES. A small transistor "sniffer". Loop construction is also described.

Intruder Watch and the W.I.A. Reprint from "A.R."

"THE SHORT WAVE MAGAZINE"

October 1969—

Signal Discriminator for CW Working, by G3RSW. An interesting receiver terminal unit, giving single-signal audio selectivity. Circuit and results are described.

Loop Aerial for Top Band, G3WPO. One method of getting out on 1.8 MHz., even though you are operating from a restricted space.

Radiating a Blip Tone, G8BQH. The idea was picked up from the Apollo 11 mission and used initially as a gimmick. During the period of use it was found that the "blip" served a useful purpose at times and the practice has been continued.

Tuning Co-axial Cable Fed Aerials, G3OVE. Described as a method of obtaining true resonance. Voltage is sampled at 13 points along a length of co-ax. which is coiled and tapped at each turn. Indicator is a 250 uA. meter.

Second Channel BCI, G3OGR. How to keep your signals from being received by BC receivers tuned to the "image" frequency.

Integrated Digital Morse Key, G3XMH. This design is based on surplus integrated circuits and operates at speeds from 8 to 40 w.p.m. Veroboard construction is used.

November 1969—

Top Band Mobile Transceiver, G3EGC. A valve design for true Tx/Rx operation. Circuitry, construction and results are described. This is a design, the success of which has been proved in operation over two years.

An AC Bridge for Measurement of R, L and C, G3TKR. A useful test instrument with a high order of accuracy.

Two Metre Receiver with Tunable First Oscillator, G3VMU. A solid state design which eliminates the multiplier chain.

High Gain VHF/UHF Aerial Array, G8ATK. Three element yagis are used on four metres, and J-Beam Parabeams on two metres and 70 centimetres.

SWL. Points of interest to SWLs are discussed by Justin Cooper.

December 1969—

Simple Tx for Four Metres, GM3NHQ. Circuitry and construction details. A chance to use up some of those old valves you have.

Light Actuated Change-over System, G3XJB. Carried out by finger control on the microphone.

Top Band Mobile Transceiver, Part 2, G3EGC. Alignment details—operation and results.

The KW Viceroy on Top Band, G3SCJ. Modification for 160 metre operation. Using separate mixer and oscillator.

Using the Heath Mobican as a Station Receiver, GC3WOW. Comments on the author's experiences in Malawi.

G3WRO/M on the Norfolk Broads, G3WRO. An account of a pleasant holiday afloat.

Tackling Receiver Alignment, G2HR. Some practical points for the newcomer.

Notes on the Eddystone 840A/840C Receivers, G3OGR. How to get to know sets which are offered in the second hand market.

"73"

November 1969—

The comments are "73's" and not those of the reviewer. My remarks are in brackets.

An Approach to Six Metre S.S.B., WA1FRJ. Using an NCX-2 or other s.s.b. transceiver.

I.F. Notch Filter, W2EEY. For the last word in selectivity for your transceiver.

Calibrate that Home brew Dial, K9STH. Accurate calibrations on any band.

continued on next page

Slow Scan Colour Pictures, WA2EMC. Using additive synthesis.

A Remote V.F.O. for the HW32A, AP2MR. Split frequency operation simplifier

Cheap and Simple for Six, WB6BIH. Three transistor PC board converter

The Mismatched R.F. Transmission Line, W5JJ High s.w.r makes no difference at all, hardly

BKX Bridge, W6BKX. R.f. bridge modelled after the General Radio bridge

Religion, Politics or Sex, W1DIS. And other "QST"-approved QSO topics.

V H F.-F M. Part 2, Mobile Installations, by WB2AEB. Another chapter in our effort to get you on f.m.

The Umbrella Antenna, W2EEY Efficient antenna for 48-80-160 metres.

Solid State 432'er Transmitter, K1CLL. Three transistor converter

Fascinating Fundamentals 1, Electrostatics, W2FEZ. Elektron is Greek for "amber".

Apoll T.V. and Radio, W1FJE. Details on the radio end of the moon trip.

The Receiver—The Overlooked Piece of Test Equipment, K1ZJH Handy

A Voltage Sextupler Power Supply, W5NGX. "QST" would never publish anything this sexy. (Do not follow his circuit—there is a short circuited input.)

The Unikey, K9MLD. If you are a c.w. man this'll get you.

Transistor Power Supplies, K5KA. Robbing power from the rig or receiver

Bias Design Without Curves, WB6BIH. Transistors just won't make it without the right bias. (I believe valves also used to give trouble.)

F.M. Receiver Tweaker, W6UAW. Alignment gadget for f.m. receivers.

A Mate for the Swan 350, WB2MPZ. Adapting the Swan TCU to the 350.

The Ball of Wax—A Calibrator, W6GXN. 200-100-50-25 KHz calibrator

Electronic Variac, K9JSC. Using a triac.

SB-33 Modification, W4MNW Adding a calibrator, c w. coverage, etc

Call Lettering Lunacy, Moschcovitz. Being about b/c call letters and such.

Extra Class Licence Course, Part 10, Staff. You should be able to pass the exam by now

S.B.E. Improvements Made Easy, W6JDD. Bunch of ideas for the SB34 owner.

December 1969—

This is headlined as a special "buyer's guide" issue. The index follows:

Quick Easy, Dependable Transistor Diode Checker, W6ICC. For those who like checkered diodes.

Did Samuel Morse Really Invent the Telegraph? W2FEZ. Telegraph? What's that?

Combination Dummy Load/Attenuator Network, W2EEY. Also doubles as a hot plate for your coffee warming. (May be okay if r.f. is very cheap!)

Tuned Filter Chokes—The Easy Way, W2OLU. Can your filter chokes carry a tune?

Hey OM—You've Got Carrier There, W4NVK. Drop dead you knit-picker.

Bandswitching the Swan 250 and TV-2, by K3LNZ. For six and two metre operation lickety split.

Cheap and Easy Selectivity, W6INU. A c.w. audio filter for less than $10.

V.H.F.-F.M. Part 3, Hand Held Portables, WB2AEB. Continuing our effort of brainwashing you into f.m

Sunspots and the Ham, WB2VFX. If you can't beat 'em, join 'em

S.S.T V., SM0BUO. Lecture at the International Congress of Amateur Television.

Amateur Radio in the Classroom, K0HUD. Drives the kids right out of their everlasting minds.

The Galaxy RV-550 Remote V.F.O., W6AJZ. Test report from an excited and happy user.

Calculation made a Little Easier, W1EZT. Stuff our dumb high schools should have taught

Universal Dual Frequency Crystal Calibrator, W2EEY Using those new IC's.

Versatilise Your Transceiver, VE3ECU/W0. Adding incremental tuning. A blessing.

Transistor Class B and C Power Amplifier Design, VK3ZRY Slide rule lovers, arise and rejoice . . . an article for you!

Two for Mobile, K6ZFV Power supplies, not a love story

Amateur Microwave Frequency Meter, 1 to 10 GHz. K1CLL. Simple, but necessary test equipment for GHz. tinkerers.

Audio Organiser, WB2WYO. Nice companion unit for the station transceiver

Converting a CB Transceiver to Six Metres, WB6BIH. What else can you do with them?

Extra Class Licence Course, Part 11, Staff. Oscillators.

Topographical Maps for the Radio Amateur, W9VZR. For transmitter hunts, and other Amateur applications.

Fascinating Fundamentals, III Magnetism, W2FEZ An irrelevant dip into history.

Correspondence

Any opinion expressed under this heading is the individual opinion of the writer and does not necessarily coincide with that of the Publishers

AUSTRALIA — AND CAPTAIN COOK

Editor "A.R.," Dear Sir,

What is all this nonsense that I hear on the air—"CQ DX from Able X-ray One XYZ"? Are we not trying to publicise Australia, plus Captain Cook? What is wrong with "CQ DX from AUSTRALIA X-RAY One XYZ" etc.?

—J. E. George, VK1JG.

[We do not agree with the idea of "fiddling" with the NATO code, but would be interested to know what others may think.—Ed.]

JOHN MARTIN REPLIES

Editor "A.R.," Dear Sir,

I acknowledge Ken Gillespie's letter on the c.w question in January "A.R." I have already submitted a further letter correcting my omission of the matter of the I.T.U. regulations. However, some further comments, if I may, on Ken Gillespie's letter

First, I question his logic where he says that the government upholds the c.w regulations because it feels that c.w. should be "encouraged". The word "encourage" implies the existence of a choice and this is, of course, not so. Certainly the use of c.w should be encouraged, but I feel that compulsion is a very poor form of encouragement.

Also, the fact that v.h.f. is not normally capable of long-distance communication is irrelevant. There is h.f. DX and v.h.f. DX. The use of c.w. is advantageous for both. But why make it compulsory for one and not for the other? If it is not deemed necessary for v.h.f., why make it compulsory for h.f.?

Further, I would certainly disagree with the proposition that c.w. is easier to learn than a foreign language. I have studied French, Latin and Greek during the past ten years, and I still find that learning c.w. is a much more formidable proposition. Please, Ken, be tolerant of the weaknesses of others!

Finally, on the proposition that we return to the pre-war regulation, I fail to see why, in order to become proficient in communication techniques, it was thought necessary to confine operators to c.w. only. Surely a phone operator can become just as proficient in communication techniques in a year as can a c.w. operator

Anyway, Ken, I would certainly prefer to discuss this topic over the microphone than through a Morse key. My fingers would inevitably get tangled up, and my arguments would come out all a-stammer!

—John Martin, VK3ZJC.

EQUIPMENT FOR A CLUB OR GROUP

I have for disposal a 40/50 watt modulator with UM transformer, prototype working solid state Amateur band receiver including all crystals in cabinet, a 2 metre converter, a BC454 6/9 MHz., a signal generator, an enclosed professionally made cabinet for 19 inch panels, about six power packs with heavily rated chokes and transformers, plus a number of other bits and pieces with no real junk.

Also, I have the last five years' issues of "QST," "S.W. Magazine" and R.G.S.B Bulletins plus various handbooks.

I would like to give these away free to any group or club of younger impecunious enthusiasts who otherwise might not be able to afford them.

Would anyone interested please write to VK3OG, 7 Thornton Road, Mount Eliza, Victoria, 3930.

New Equipment

RECHARGEABLE BATTERY

A complete range of Sonnenschein, dry-fit batteries is now available from R. H. Cunningham Pty Ltd. Sonnenschein batteries are rechargeable lead-acid accumulators which require no maintenance and have all the advantages of dry batteries. They may be heavily loaded, and will operate in any position; they can be stored for long periods of time, and are ideally suited for use in portable equipment. A 22-page, fully illustrated technical manual on dry-fit batteries and charging techniques is available from R. H. Cunningham Pty. Ltd., 608 Collins Street, Melbourne, 3000.

S.S.B. TRANSCEIVERS

Two new amateur band transceivers have now been made available in Australia. Manufactured by KW Electronics Ltd., Dartford, Kent, U.K., the model KW "Atlanta" is a 500 watt p.e.p. unit operating from 10 to 80 metres, and the model KW 2000B transceiver has 180 watts p.e.p. (150 watts c.w.), 10 to 160 metres. Designed specifically for amateur use, the units are built to high engineering standards and have all the feature requirements for amateur operation. Illustrated technical specifications are available from the Australian agent: Sideband Radio, 73 Cole Street, Elwood, Vic., 3184.

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SOLID STATE S.S.B. RECEIVER

(continued from page 17)

The b.f.o. and product detector should be mounted well away from the i.f. circuitry to avoid any injection of the b.f.o. signal into the i.f. amplifier. The effectiveness of shielding between these two stages may be checked by disconnecting the b.f.o. from the product detector and listening for a beat note on an a.m. signal.

AUDIO HANG A.G.C.

The audio derived a.g.c. consists of a two-stage audio amplifier which operates from the detector output to produce a convenient signal for detection. An emitter follower detector circuit is used since it enables a very fast rise time. The fall time is determined by the emitter time constant, and may be selectable as shown. Time constants shown are 0.5 second and 2.5 seconds, but may be adjusted to the individual's preference.

The S meter operates directly from the a.g.c. control line and is a 100 μA. movement. If it is desired to use a 1 mA. movement then an extra stage of current amplification is necessary to avoid loading the detector output. An alternative circuit for a 1 mA. movement will be described at a later date.

The next article will deal with the design of the v.f.o., mixers and crystal oscillators.

VHF

Sub-Editor ERIC JAMIESON, VK5LP
Forreston South Australia, 5233.

AMATEUR BAND BEACONS

VK4	144.390	VK4VV,	107 m. w. of Brisbane.
VK5	53.000	VK5VF,	Mount Lofty
	144.800	VK5VF,	Mount Lofty
VK6	52.006	VK6VF,	Tuart Hill
	52.900	VK6TS,	Carnarvon
	144.500	VK6VE,	Mount Barker (Albany)
	435.000	VK6VF	on by arrangement)
VK7	144.900	VK7VF,	Devonport
ZL3	145.000	ZL3VHF,	Christchurch N.Z.

You might be excused for asking why have the v.h.f. notes for this month been preceded by the list of Amateur beacons? There are certainly very good reasons that this should be so. If ever any demonstration was needed of the value of beacons it was shown at the end of January. Commencing on the night of Friday, 30th Jan., Garry VK5ZK observed VK6VE, the 2 metre beacon at Albany, was good strength in Adelaide. He also observed that Bernie VK6KJ was on 40 metres in a contact, and Bernie operates from Albany! It was only a matter of time before a cross-band contact 40 to 2 metres was in operation, continuing to a full 2 metre both ways QSO, with signals S6 to S8, around 2300 EST. Subsequently, Mick VK5ZDR, Bob VK5ZDX, Col VK5RO and John VK5QZ worked VK6KJ who was operating on 144.015 MHz. During this time the beacon continued about S5 to 6. The next morning on the 31st, the beacon was there again, continuing on and off throughout the day, and culminating in another group of contacts with Bernie that night, again with very good signals.

However, the prize really must go to the Sunday, 1st Feb., for a day of outstanding 2 metre achievement. The beacon was there first thing in the morning and so was VK6KJ. Some contacts were made around 0900 EST; after the VK6WI broadcast the VK6VE beacon continued to indicate to all and sundry that the path was open to the west and improving, leading up to some 1½ hours of contacts between Bernie and every available VK5 (including myself behind a thundering great hill to the west!) Not being content only with the Adelaide area contacts, Bernie made it two way with Colin VK5ZKR in Mt. Gambier (1,250 miles), Chris VK5ZFA at Millicent (1,300), culminating in a contact with Bob VK3AOT at Mt. Waverley and Geoff VK3AMK at Frankston, at distances around 1,550 miles, signals being R5 x S5.

What a grand day it was. V.h.f. has not received such a shot in the arm for a long time and if ever you fellows in VK2 and VK3 need proof of the value of beacons, particularly on 2 metres, you should have it now! Perhaps if VK2 cannot do it, would VK1 think about it, being favourably situated from Adelaide, Melbourne and Brisbane. It is very certain that none of these contacts would have eventuated without the advance warnings given by the two beacons. An interesting observation was that these contacts were being made even after 1130 EST!

During the same period some tremendous signals were being received from VK3 into VK5, so it appears the whole of the southern area of Australia was wallowing in a huge v.h.f. trough. Tony VK5ZDY at Stirling in the Mt. Lofty Ranges worked Winston VK7WF on 2 metres, while on 432 Tony had a full strength 1¼ hour contact with Colin VK5ZKR in Mt. Gambier (200 miles), following it the next morning by almost making it two ways on the same band with Gordon VK3AGV in Colac (350 miles).

AUSTRALIS OSCAR 5

Another milestone in 2 metre activity is surely being shown by the continuing successful operation of the 2 metre beacon of the Australis ever since launch. Full credit must go to all those who have worked so hard in preparing the package, and they, as well as us, the remainder, must feel a great measure of pride that Amateurs can still make things to work. It seems incredulous that the small power output of the device can make such a big signal in a receiver at such long distances, and the whole venture has created a lot of genuine interest, particularly as the 2 metre beacon can be copied on even rather mediocre equipment. No further comment in this column as I would expect the whole success story will be the subject of a special article by those better informed.

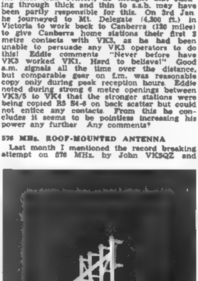
From Roy VK6ZFL, of the Carnarvon Amateur Radio Club, comes news that they now have a beacon operating 24 hours a day on 52.900 MHz. using the call sign VK6TS in c.w. followed by a six-second key down period. It runs with about 8 watts output to a vertical dipole 40 feet high, reception reports would be appreciated and should be sent to the Secretary, Carnarvon Amateur Radio Club, C/o. A.W.A., Box 348, P.O., Carnarvon, W.A., 6701. The boys there have a local 52.6 MHz. net with eight stations on. Transequatorial scatter contacts with JA are possible from there for about eight months of the year. Only two sporadic E type openings have been noted at Carnarvon this year and it is hoped the availability of their beacon signals might persuade some of the stations to the east to turn their beams north-west! 2 metre activity in that area is restricted because of locality, being 600 miles from Perth.

Roger VK2ZRH reports from the Sydney area that JA contacts from there have been available on and off during November, December and January, indicating the path was not lengthening enough for the signals to reach the southern States. Roger worked David ZL4PG on 52.050 MHz. on 1st Jan. This is interesting as David would be the first ZL4 on 6 metres to be heard for a long time. It is to be hoped his overall activity will increase next year, many are still looking for that elusive ZL4 for W.A.D.Z.L. Of further interest, Roger mentions hearing VK3s or VK5s on 144 MHz. ragchewing on 6th Dec., but despite repeated calls with full power, they could not be broken up. Such is the luck of the game; at the same time, however, had there been a beacon in VK2 on 2 metres some other VK5s might have been able to do something about it!

Pleased to have a letter from Eddie VK1VP who reports not a lot of 6 metre contacts in the Ross Hull Contest; he thought that sticking through thick and thin to s.s.b. may have been partly responsible for this. On 3rd Jan. he journeyed to Mt. Delegate (4,300 ft.) in Victoria to work back to Canberra (120 miles) to give Canberra home stations their first 2 metre contacts with VK3, as he had been unable to persuade any VK3 operators to do this! Eddie comments "Never before have VK3 worked VK1. Hard to believe!" Good a.m. signals all the time over the distance, but comparable gear on f.m. was reasonable copy only during peak reception hours. Eddie noted during strong 6 metre openings between VK3/5 to VK4 that the stronger stations were being copied R5 S4-6 on back scatter but could not entice any contacts. From this he concludes it seems to be pointless increasing his power any further. Any comments?

576 MHz. ROOF-MOUNTED ANTENNA

Last month I mentioned the record breaking attempt on 576 MHz. by John VK5QZ and Graham VK5ZJL. A photograph in this issue depicts the specially made roof-mounted antenna used by John. Further to this, John and Graham recently joined forces and journeyed to Mt. Gambier to try and work back to Tony VK5ZDY at Stirling. Contacts were very scratchy over the 200 plus miles path, but two way contacts actually were made. Further details next time.



John VK5QZ with his roof-mounted 32 extended element 576 MHz. array.

GENERAL NEWS

Brian VK5ZBR at Gawler, 25 miles from Adelaide, got in a few very "sneaky" contacts with some JA stations on Sunday, 25th Jan. JA1ODA was worked at S9, while those from JA3 and JA7 managed to rise to S5. Everyone else seemed to have been concentrating on tracking Oscar 5 and missed out. Brian also reported the Japanese beacon JA1IGY on 51.995 with m.c.w. was S6.

I am pleased to report that VK4VV is now operating on 144.390 MHz. on m.c.w. This is the latest 2 metre beacon to take to the air and is the long awaited final effort from VK4 and will be a very welcome addition to our gradually lengthening list. The station is located 107 miles west of Brisbane, no other details are yet available. Thanks to Tom VK4ZAL for sending telegram about this.

One of Australia's leading Amateurs (not a VK5 either) has suggested we should all give serious consideration to becoming more acquainted on the v.h.f. bands with Greenwich Mean Time (GMT), not only for contests, but in field day operation, and contacts of all types. He points out that this year he has received QSL cards bearing WAST, SAST, CST, TST, EAST, etc. Tasmania is using Summer Time, there is a possibility other States will follow, what then? Overseas QSL cards invariably carry GMT, which anyone may convert to local time for checking logs. Frequently cards sent overseas with local time only are never replied to at all. These are all valid points and worth thinking about. In most shacks the least requirement for ease of conversion would be another clock set to GMT, your QSL cards would carry GMT, so no re-conversion is needed. It is realised of course that it is one thing to have people agree to such a proposal, and another to get everyone to do it, but a start could be considered somewhere. What are your opinions about this? Have you any opinions to add to suggestions that the lowest 100 KHz. of both 6 and 2 metres should be reserved for DX working, and that local contacts be avoided in this area? Any comments in writing will be added to those already received. Some conclusions may be ultimately drawn.

Peter VK3ZYO, in a letter re VK3 activities, says quite a few Ross Hull Contest operators took advantage of the increased points outside 50 miles from a capital city, and went out portable. Very pleasing indeed to see this upsurge in portable activity. I note that Bob VK3AOT spent a week in a caravan on Mt. Buninyong using 6, 2 and 432, and Alan VK3ZHU tried to break the 1296 MHz. record with Ian VK3ATY and camped on various peaks outside the 50 mile limit, using 144, 432 and 1296 MHz.

Peter reports 1296 MHz. activity is pretty constant with about seven stations on. Four of these, VKs 3AKC, 3ZKB, 3ZHU and 3ZYO used the band consistently to increase their Ross Hull scores, which was particularly helpful in view of low scoring on 432 and 144 to Interstate.

So far Ron VK3AKC and Wilf VK7WF have not quite made it on 1296 MHz. across the water two way, but signals are being heard, so it appears only a matter of time.

Interesting to note the path from Bernie VK6KJ did extend inland enough for a period to allow Ray VK3ATN at Birchip to work him on 2 metres. Fancy Roy VK3AXV going on holidays at this time.

That seems to be about all the general news for now. Closing with the thought for the month: "It may take forever to win man's minds by persuasion, but that's quicker than you can do it by force."

73, Eric VK5LP, The Voice in the Hills.

STOP PRESS (3/2/70)

The tremendous ducting to VK6 from VK5 continues unabated. Signals just as strong as ever after four days and nights. Bernie VK6KJ has worked about every 2 metre signal likely to be available around southern Australia. Wally VK6WG and Brian VK6JA now getting in on the kill. Signals from them rather selective, and some stations in VK5 not hearing them. Signals on 432 MHz. have been exceedingly strong over paths of hundreds of miles. Some even looking for these outstanding conditions, never observed before, to abate somewhat to allow some more sleep to be had. Many 2 metre transmitters and converters brought out of mothballs of years standing to work VK6.

(continued on next page)

VHF NOTES

MEET THE OTHER MAN

Mr J L C Bickford lives at 22 Mansfield Street, Rockhampton, Qld., and probably better known to all of us as Lance, VK4ZAZ/T. For those situated at the end of the longer skip paths few 6 metre DX openings to VK4 would not include a contact with Lance. First licensed in 1957, he originally operated on the 56 MHz. allocation before 50 MHz. became available. On 52 MHz. at present Lance runs 150 watts of a.m. using push pull 6146s, a wide spaced 4 element yagi 45 feet high, converter frame grid r.f. end to an AR7. On 144 MHz. he runs 130 watts of a.m. or 300 watts p.e.p. on s.s.b., using QQE06/40s. The antenna is a 10 element yagi, 53 feet high, nuvistor r.f. front end in converter to a BC312. The modulator uses Class B zero bias 807s.

Lance's list of prefixes worked on 6 metres reads like a book. VK1 to VK8 inclusive, two areas of VK9, ZL1, ZL2, ZL3, W, KH6, KR6, KG6, HL9, JA, being made up of some 2,900 contacts, all but a few being DX contacts. Other areas heard include W7, W0, CE8AE (beacon), VS6CJ, British Ch. 1 and Ch. 2 t.v. sound, and various Russian and Asian t.v. stations frequently. All these have been heard in the region 40 to 50 MHz. Awards received for 6 metre operation include Worked All States, All Japan Districts, 1st VK4 National Field Day 1962, 1st VK4 Ross Hull. He is eligible for but has not claimed yet Worked All JA prefixes, One Day AJD, and Elizabethan Award. All that represents a pretty good innings on 6 metres.

Lance VK4ZAZ/T

Things go quite a bit quieter when it comes to 144 MHz. as his only contacts on that band have been during periods of high sporadic E activity. However, Lance has managed to work VK2, 3, 4, 5 and 7, and holds the VK4 State record for working VK7ZAH on 1/1/67. He also holds the State record on 6 metres for his contact with K6GRC in 1958. His location is about 300 feet above sea level.

Looking to the future Lance is interested in high power scatter research on 52, 144 and 432 MHz., and is considering 432 MHz. portable operation from Mt. Archer, 2,000 feet a.s.l. not far away. Television experiments on 433 are also pending, using a nuvistor converter into his 52 MHz. converter.

With his information Lance forwarded several pages of very interesting observations made over years of DX working. A pity there is too much for inclusion here, but he has summarised a few points. Best DX worked, 6 metres to W6, 2 metres to VK7. His most gloomy period was listening to W7s and W0s working W6s, some using 20 watts to converted 522s, and peaking S8! He makes an observation that for some trans-equatorial conditions both s.s.b. and c.w. are useless. Extra high level a.m. is superior under these conditions.

I feel Lance has so much to offer from interested observations of propagation phenomena that it would be worth a separate article in "A.R." This will have to be looked into. One experiment he mentions is that of working JA2 when 100 mW. of signal produced an S9 plus report, and so on. Thank you, Lance, you are an interesting man in an interesting location.

NEW CALL SIGNS

[redacted]

VK0GR—Hea Gehrke, Casey, Antarctica.
VK0HM—H. Milburn, Heard Island.
VK0KW—K. P. Warchot, Macquarie Island.
VK0LD—H. H. Brown, Macquarie Island.
VK0MZ—M. D. Zappert, Davis, Antarctica.

VK2BAZ—C. R. B. Bamford, 23 Painters Lane, Terrigal, 2260.
VK2BDN/T—R. C. F. Norman, 23 Queen St., Croydon, 2132.
VK2BEV E. J. Van Bierk, 35 Larool Cres., Thornleigh, 2120.
VK2BKP—K. J Pickett, 8/7 Lowe St., Clovelly, 2031.
VK2BLX—A. E. Barlow, 654 Princes H'way, Sutherland, 2232.
VK2BWF W. F. Cromarty, 560 Buchhorn St., Lavington, 2641.
VK2BWG—R. G. Wright, 25 Mermaid Ave., [redacted]
VK2ZLO/T—J. Rowe, 51 Merley St., West Strathfield, 2140.
VK2ZNL—F. W. Nolan, 122 Carringbah Rd., Randwick, 2031.
VK2ZYD—S. Griffith, 1/46 Nicholson St., Wollstonecraft, 2065.

VK3JU—C. J Holliday, 30 Gardenia St., Blackburn, [redacted]
VK3MK—B. P Bailey, "Selworthy," 298 Mitcham Rd., Mitcham, 3132.
VK3ON—J. G. Foster, 58 Fulton Rd., Mt. Eliza, 3930.
VK3UL—A. H. F. Nickols, 7 Judith St., Carnegie, 3163.
VK3AAM—P. S. Carne, 3 Thurling St., Mentone, 3194.
VK3ACL—P. C. McEwan, 16 Falcon Crt., East Doncaster, 3109.
VK3AHA/T—G. Collings, Lot 66, Evelyn Rd., Ringwood, 3134.
VK3AIW—J. R. Graham, 14 Malcolm St., McKinnon, 3204.
VK3AQU—R. H. Leskie, 15 Cecil St., Horsham, 3400.
VK3AZM—D. L. Godfrey, 10 Alexander Ave., [redacted]
VK3BAA—G. R. Crosier, Flat 9, 1314 Main St., Ballarat, 3350.
VK3BAG—R. J. L. Kelly, 62 Kilby Rd., North Kew, 3101.
VK3BAL—F. Hattam, Appel St., Castlemaine, 3450.
VK3BAM—J. V Griffin, 55 Percy St., Mitcham, 3132.
VK3BAZ—I. J Kennedy, 15 Cook St., Newtown, 3220.
VK3BBC—T. M. Davis, "Midlands," Tatura, 3616.
VK3BBD—A. K. Bothe, 241 Royal Pde., Parkville, 3052.
VK3BBJ—J. Gruber, 18 Newcastle St., East Preston, 3072.
VK3BBK—G. P Jenkinson, 7 Gladesville Dr., East Bentleigh, 3204.
VK3BBL—G. N Brown, Yanac, 3418.
VK3BBM—R. C. Marschke, 55 Alma Rd., East St. Kilda, 3183.
VK3BBO—D. R. Hutton, 17 Trent St., Newborough North, 3828.
VK3BBW—G. C. F. Dillon, 7 Banksia Crt., Heathmont, 3135.
VK3BBX—L. J. Middleton, Flat 3, 6 Blamey St., Ascot Vale, 3032.
VK3BCJ—R. C. G. Jackson, 36 Hampton St., Broadmeadows, 3047.
VK3BCL—R. J. H. Clarke, 23 Glen Dr., Eaglemont, 3084.
VK3BCQ—P. T. Ament, 12 Hastings St., Wendouree, 3355.
VK3BDH—T. D. Hogan, "Madang," King Lake Rd., Cottles Bridge, 3099.
VK3CCA—R. J. Linskeet, Sergeants' Mess, No. 1 Stores Depot, R.A.A.F., Tottenham, 3012.
VK3YAE—M. Imber, 2A Carinya Cres., North Caulfield, 3161.
VK3YAF J. R. Beaumont, Flat 3, 564 Pascoe Vale Rd., Pascoe Vale, 3044.
VK3YAH—Swinburne Electronics Society, C/o. Swinburne College of Technology, John St., Hawthorn, 3122.
VK3YAI—P. R. Johnstone, 63 Karnak Rd., Ashburton, 3147.
VK3YAM—P. R. Maher, 34 Candover St., Geelong West, 3218.
VK3YAO—A. W. Biddle, Flat 4, 74 Stephenson St., Kew, 3101.
VK3YAP—R. E. Proudlock, 14 Railway Cres., Korumburra, 3950.
VK3YAQ—B. A. Butler, Flat 4, 12 McCracken Ave., Northcote, 3070.
VK3YAR—R. J. Malcolm, Boisdale, 3860.
VK3YAW—P. J. McClusky, 13 Holloway St., Newport, 3015.
VK3YAY J. R. Morehouse, Flat 4, 7 Derry St., East Bentleigh, 3165.
VK3YBC—W. F. Colborne, 80 Hill Rd., North Balwyn, 3104.
VK3YBE/T T. G. Foster, 802 Sebastopol St., Ballarat, 3350.
VK3YBG—M. Gregory, 19 Burns St., Wangaratta, 3677.
VK3YBH—B. T. Houston, 10 Kerby St., Eltham, 3095.
VK3YBN—G. F. Shaw, 31 Landsborough St., North Ballarat, 3350.
VK3YCE—C. W. Eyre, 138 Sailors Gully Rd., Eaglehawk, 3556.
VK3YCK—M. C. Elias, 20 Thoresby Gr., Ivanhoe, 3079.
VK3ZNZ—T. R. Powney, 72D The Terrace, Ocean Grove, 3226.
VK3ZVT D. S. Thomas, 24 Albert St., Mount Waverley, 3149.

VK5XT K. H. May, 37 Janice St., Murray Bridge, 5253.
VK5ZFO—R. J. Lever, 6 Waite Rd., Urrbrae, [redacted]
VK5ZLA—L. A. Crighton, 109 Seith St., Albert Park, 5014.
VK5ZLZ—D. J. Brown, 17 Kentish Rd., Elizabeth Downs, 5113.
VK6ZGL—D. S. O'Sullivan, 8 Eileen St., Cottesloe, 6011.
VK6ZGN—J. B. Wilcox, Flat 9, Alexander Court, 31 Herdsman Pde., Wembly, 6014.
VK6ZGQ—L. J. Pannell, 90 Hare St., Kalgoorlie, 6430.
VK7ZIR—I. R. Milne, 156 Roslyn Ave., Blackmans Bay, 7152.

VK8ZCF—B. M. Chester, Flat 3, Cr. Nudl and Quarry Sts., Stuart Park, Darwin, 5790.

VK9AE—F. A. Eastick, Station: Port Moresby, P., Postal: P.O. Box 2087, Konedobu, P.
VK9BL—J. B. Lennon, Station: Portion 51, Cr. Musgrave St. and Ela Beach Rd., Port Moresby, P., Postal: C/o. OTC(A), P.O. Box 55, Port Moresby, P.
VK9DS—B. W. Smeaton, Station: Section 38, Lot 7, Madang, N.G.; Postal: P.O. Box 446, Madang, N.G.
VK9ES—E. Sundstrup, Station: Flat 2, Lot 3, Section 2453, Dysox St., Lae, N.G.; Postal P.O. Box 1134, Lae, N.G.
VK9GG—G. E. Groat, Station: Lutheran Mission, Madang, N.G.; Postal: Lutheran Mission, P.O. Box 676, Madang, N.G.
VK9LL—P. R. Gibson, Station: T.C. Wee St., Rabaul, N.G., Postal: P.O. Box 530, Rabaul, N.G.
VK9MS—N. P. Stime, M.D., Station: Lutheran Mission, Madang, N.G.; Postal: Lutheran Mission, P.O. Box 676, Madang, N.G.

[redacted]

VK3BAI—R. E. Maricle. Previously recorded as VK3BAT.
VK3BAR—C. J. Kosina. Previously recorded as VK3BAL.

CANCELLATIONS

VK2IO—A. E. Barlow. Now VK2BLX.
VK2LL—P. R. Gibson. Now VK9LL.
VK2AHS—N. E. Parsons. Transferred to T.P. N.G.
VK2ZCF/T—R. C. F. Norman. Now VK2BDN/T.
VK2ZWC—W. F. Cromarty. Now VK2BWF.

VK3AFX—J. G. Foster. Now VK3ON.
VK3AHV P. E. T. Weaver. Not renewed.
VK3AUE—R. Greig. Transferred overseas.
VK3AYX—B. P. Bailey. Now VK3MK.
VK3ZFA—G. F. Jenkinson. Now VK3BBK.
VK3ZGL—I. J. Kennedy. Now VK3BAZ.
VK3ZHC/T G. Collings. Now VK3AHA/T.
VK3ZHD—G. C. F. Dillon. Now VK3BBW.
VK3ZLT—P. C. McEwan. Now VK3ACL.
VK3ZOS—G. N. Brown. Now VK3BBL.
VK3ZOZ—D. L. Godfrey. Now VK3AZM.
VK3ZQP—P. C. Carne. Now VK3AAM.
VK3ZTL—T. L. Lindsay. Not renewed.
VK3ZVG/T—G. A. Cohen. Transferred to A.C.T.
VK3ZYF—C. J. Holliday. Now VK3JU.
VK3ZYU—R. J. H. Clarke. Now VK3BCL.
VK3ZZA—P. T. Ament. Now VK3BCQ.

VK5ZGC—K. A. Sweeny. Not renewed.
VK5ZKM—K. H. May. Now VK5XT.
VK5ZQB—H. Dittloff. Not renewed.

VK6RT—J. P. Morgan (Rev. Bro.). Transferred to Victoria.
VK6ZCF B. M. Chester. Now VK8CF.

VK9JS—J. B. Stacy. Transferred to N.S.W.
VK9KW—K. W. Turtle. Not renewed.

DX

Sub-Editor DON GRANTLEY
P.O. Box 222, Penrith, N.S.W., 2750
(All times in GMT)

The AX prefixes have certainly given us a much needed boost in activity, and it is pleasing to notice quite a number of calls which had been somewhat obscure over the past few years now very much to the fore in the DX field. In the interests of retaining our frequency allocations, let us hope that this increased activity remains after the AX allocation has been withdrawn.

Band conditions have been holding up reasonably well, twenty metres as usual is to the fore, but there have been some fine openings on the other bands, namely ten which has been producing some fine openings in the early hours. Recently, signals were pounding in from Europe at around 1600z, and I noticed openings today Feb 11 at 2000z. So the activity continues, there still remains a wealth of c.w. DX on forty metres, despite the commercials. From the S.w.l. angle most of it is readable, but to work it may be a different matter. Shift the JAs from fifteen metres and there must be some good DX there, however the QRM from the former seems to over-ride the other stations.

Whilst the bands remain fairly good, so too does the quality of the DX, particularly around 2000z on twenty metres, and if current rumors of projected activity are any way true, then we are in for a feast of DX. Some on the rumor list are ZK1/Manihiki, FH8, VQ1, 9J2ED planning a jaunt to Botswana and taking 160 metre gear, W9FIU a maybe for Swan Is. and Serrana Bank, FR7ZQ shortly from Europe, and finally, a YI station is reported active at the time of writing

It is understood that no more nationals will be licensed from San Marino, however activity will continue as the Italian Amateurs will still be able to obtain operating permits. Currently active from there is M1B, who has been on 14235 at 1800z.

There is still quite an amount of activity from Thailand with HS1AF, John, Box 2008, Bangkok, HS4KH, QSL to K4WHK; HS2JR, HS3JR "Riff", QSL to VK1RR, WB4HID/HS3, and HS4ADJ who QSLs via WA2VTL.

From Galapagos comes a report that HC8FN is due back there and will have better antennae this time. WA2WUV, who is his QSL manager, reports that many QSLs are received by him for HC8FN c.w contacts, however these contacts are with a pirate as Forrest HC8FN does not work c.w

The following prefixes are active on 80 mx and audible in this country. VP2, XW8, ZM/K, VS6, 4U1, UY, OH, ZF1, YU3, HA5, PJ2, 8Y4, VK9, PZ1, HI8 and many others. With the exception of ZF1GC, all were on c.w.

There has been a further broadening of the reciprocal operating agreement between Britain and the U.S.A., to include many of the Commonwealth countries. A brief outline of them is given in the Long Is. DXA Bulletin of Jan. 20, however a full summary of the situation will be published in the March issue of the A.R.R.L. publication "QST"

The relief crews for the popular FB8 stations have been announced and here is the story as I have it. FB8ZZ from New Amsterdam will be operated by Georges, and QSLs go to F5US FB8YY from the Antarctic will have a new op., but QSLs still go via F9MS who, by the way, is awaiting the 1969 logs. FB8XX from Kergulen should be staffed by four ops. after Henry goes QRT. One will be Maurice F6APG 14040 daily c.w 0130 to 0200z, and 14137 KHz. s.s.b daily from 16-1700z. 21220 Sundays at 1300z. F2MO remains QSL manager and he expects to have the 1969 logs by the time you read this. The new operators at all the bases should have taken over by this time

There will be a change of operator from Comoro Is., FH8CD due to go QRT, will be replaced by Hughes FH8CE with no break in operation.

Activity from Cape Verde Is. is reported from CR4BQ on 14131 KHz. at about 2000z, QTH Box 43, St. Vincent, Cape Verde Is., and a second station CR4BC "Julio", who has been also on forty and eighty s.s.b.

Congratulations to Bob VK2ASZ for being both Continental and Country winner for the recently held Lebanon R.A.L. Contest. Bob, who lives only a few miles down the road from this QTH, is one of our younger and more versatile operators, being equally at home on c.w as on s.s.b., and is also very prominent in v.h.f. circles.

The operation by K2IXP from C3ICQ Andorra is having cards returned by the A.R.R.L. however it is believed that the operator will provide the necessary substantiation that is required to qualify this jaunt for A.R.R.L. credit.

QSLs for the activity from Heard Is. VK0HM will be forthcoming, but don't despair if you have to wait until maybe June when he is due back to civilisation.

If you are looking for CE0AE on Easter Is., it may be of interest to note that they are normally on 21 MHz., but do come down on to twenty on Wednesdays only Usually they are around 14220 from times ranging from 0400 to 1200.

The 1R0 prefixes currently in use are for stations situated in Rome for 1970, and are valid as prefixes only. The two most often heard here are 1R0JZ, who says QSL to I1JX, and 1R0KGR, who asks for his QSLs to I1DLP

Midway Is. usually has regular operation, therefore is not often in the news, however K4BNV/KM6 is a new one to me. Benny is the operator and is usually on 28545 on Saturdays at 2100z. and as ten metres is often wide open then, a contact on that band could result.

KS4 Swan Is. is about to be handed over to Honduras in the near future, and the A.R.R.L. advise that no decision will be made as to its future status for A.R.R.L. D.X.C.C until the Governments concerned have finalised their agreements, and these have been studied by the League. They add that any decision to alter the present status will be announced in "QST"

Re the operation late in December from Market Reef by 0J0MR, this operation has been classed as one of the best operations ever. Their departure was delayed by bad weather and the time was given over to extensive operation on forty and eighty c.w., to enable DX hunters to gain more credits toward five-band D.X.C.C. The c.w operator required the receiving operator to repeat back 0J0MR's report to him, and he would acknowledge the confirmation. It has been suggested that if this requirement was not complied with, then maybe no card will follow. I don't say this will be the case, but apparently there is a good chance. QSLs for the operation go to OH2ND, and the less we say about the manners of some who tried to make contact, the better.

Once again we have to refer to a rumor, this concerns a story that SV0WOO, operating from Greece, was in fact a pirate. This according to the LIDXA is incorrect, as SV0WOO is in fact very legal and asks for his QSLs via W. S. Kelly, U.S. Embassy, Athens, Greece, or via A.P.O New York 09223.

Several odd calls showed up from the U.S.S.R. during the early part of December U4L/2 was a special station travelling through Russia, U4L/1 was an expedition to Ulenovah, UK0A was an expedition to Zone 23, with no information available on UK0B. All QSLs to Box 88, Moscow.

Have you worked or heard TY6ATE and wondering what has happened to your QSL? The holder of the call, Fred Powell, advises through his QSL manager, W4WHF, that the station was used for a few contacts in 1967 and all contacts since then must have been with a pirate

The operation from Revilla Gigedo by XF4KS and XF4EB was completed on Dec. 17 without incident, and QSLs for the former go to XE1OOJ and the latter to XE3EB. this call by the way was used for twenty metre operation only.

Operation from Qatar was due to have taken place on Feb. 21 running to 27, as the operation will be completed by the time this copy reaches you, we will be content with QSL data. Call MP4QBK, and for other than VE and W contacts, the QSLs go to MP4BHH with I.R.C. if possible.

Talking of direct QSLs, recently the P.M.G Department reduced the surface mail rate on letters to some of the Asian and Pacific countries from Foreign to Commonwealth rate. The reduction is from seven cents per ounce to five cents per ounce, and it applies to KS6, XZ2, XU, KC6, KX6, BV, all the French Polynesian countries, YB, JA, XW8, CR9, KG6, 9N1, FK8, DU, CR8, KR6, HL, HS plus all U.S. territories in Oceania and South Vietnam. The reduction does not apply to other than surface letters and cards.

A note to hand from Keith VK4DG to the effect that there will be a further jaunt to TI9PE/TI9 Cocos Is., from March 1 for four weeks. The operation will be on five bands and both modes will be used. There is a trip planned by Don K8JGS for Feb. 10. QSL via TI2CMF LR Cs and S A E. required, but whether this is related to the one mentioned by Keith, I don't know It is understood that the TI9CI group, consisting of seven operators, will go to Roncador CAY as W9FIU/KS4B

Dr Fred Lieberman is now in Sikkim mainly to tape music of the Hill people, however he has the call AC3PT and has been reported on frequencies around 14220 at times ranging from 1200z to 1500z. His QTH for QSLs is his home address, W1FLS, Dr Fred Lieberman, Music Dept., Brown University, Box 703, Providence, R.I., U.S.A.

Further to a previous note on the recent operation to Market Reef, it is reported that they plan a further trip there in May, using more c.w operation and assisting those hunting five-band D.X.C.C. On their recent trip, they worked 140 countries, and made 9,800 QSOs.

VQ8CFB, operating from St. Brandon, has now forsaken the unstable v.f.o. for xtal control using rocks donated by W5VA and W1WDD. The controlled frequencies are 14028, 14130, 230 and 330. He plans to be there until May and asks for QSLs to go to Box 467, Port Louis, Mauritius. These countries are listed for new prefixes if they are not in operation already, 3B6 for Algalea, 3B7 for St. Brandon, 3B8 Mauritius, 3B9 for Rodriques

ZK1AJ is QRV from Raratonga for two years and hopes to have a quad erected shortly. He checks into the Pacific DX net on 14265 on Tuesday and Friday Geoff Watts' news sheet says QSL to KH6GLU with S.A.S.E. and I.R.C's. He was pounding in at this QTH one afternoon in early January at 0630z. I believe you can QSL him direct to Box 90, Raratonga, Cook Is.

OK5FIS is a special station operating from Dec. 1, 1969, until April 30, by Radio Club Tatry, from the Tatry mountains to cover the world ski-ing championship. Uses one kw on all bands. QSLs to OK3BHU or the Bureau

A note to hand from Ian VK3BBA to the effect that Norm Chapman, ex VK3ANC, is now resident in Zambia with the call 9J2NC He would be delighted to contact any VK and wishes to be remembered to friends in the Eastern Zone. His address is Box 124, Lusaka, Zambia. Ian's contact was on 14180 at 1845z.

9N1RA is a YL, Jinny Beyer, Box 81, Kathmandu, Nepal. In a recent QSO with Barry VK5BS, she gave her manager as K8OE whose QTH we were chasing last month In a second QSO with Barry the above address was forthcoming

The station signing YT1BCD operator "Vasa" is a special prefix being used by the Pancevo Radio Club station YU1BCD to commemorate 25 years of Independence. I understand most YUs are using the prefix

KJ6BZ should be QRT by now after his period of service, and in a QSO on Jan. 4 said that all requests for QSLs for his past operation should now go to home address of W0EJP

ZS2MI from Marion Is. is now on s.s.b. and is on the air daily from 1500 to 1600z on 14200. Another report says his frequencies range from 14145 to 150, with QSL to ZS6LW

Franz Josef land has been represented regularly on c.w. by UA1KED, however for those who are looking for Zone 40 on s.s.b., it is understood that UA1KBW/UA1 will be having a s.s.b. expedition to Franz Josef in April of this year

It is understood that Pete, ex DL4PM, is operating as XV5PM from Vietnam, also from on board ship off the coast as WA2USX/MM. Most of the operation is on 80 metres and he has been logged in the U.K. at 2200z on 3795.

Another pirate for the list. ZD9BE has been heard quite a lot in recent months, however the real one went QRT and left the location months before the pirate appeared

KC4USV is at McMurdo Station on Ross Island and is located in Zone 30. His QSL goes to KC4USV, C/o, Commander Antarctic Support Activities, F.P.O., New York, N.Y., U.S.A., 09501

Finally, chaps, I have filed away here the last twelve months issues of LIDXA news sheet, Geoff Watts News Sheet and Monitor. These contain amongst them most of the information pertaining to out of the way DX operation during the period Should any reader need information on a call worked or heard during that period drop me a s.a.s.e giving date only of QSO and I will check for them. Thanks for this month's issue to the ISWL. Geoff Watts DX News Sheet, Long Island DX Assn., Barry VK5BS, Jack VK3AXQ Ernie Luff, Chas Thorpe and N Z A R T. I would also like to thank those who have written to me over the Christmas period, and I appreciate your interest 73 de Don WIA L2022.

SILENT KEY

It is with deep regret that we record the passing of —

VK3CX—Alan G. Brown.
VK3GX—Reg Gibson.

FEDERAL AWARDS

COOK BI-CENTENARY AWARD

The following additional stations have qualified for the award.—

Cert. No.	Call	Cert. No.	Call
3	AX6FO	22	AX4LZ
4	AX1BC	23	ZM1BBH
5	AX3JW	24	AX5WV
6	AX2NS	25	ZM1AKG
7	ZM3NS	26	KH6AH
8	AX4UC	27	G8NY
9	ZM1QN	28	ZM3FM
10	AX3AMK	29	AX3AIC
11	AX7PD	30	AX7JV
12	ZM5RK	31	AX5ZB
13	DL8NU	32	W8SPJ
14	9J2GJ	33	CT1FL
15	OA4LM	34	JA9CAF
16	AX4KS	35	AX2QZ
17	ZM2FA	36	W3BVL
18	AX5FY	37	LA3XG
19	AX4DO	38	AX3LV
20	CR7IC	39	G3AAE
21	9V1NR	40	KA9JC

FEDERAL AWARD RECORDS

To enable accurate and up-to-date records of W.I.A. awards to be maintained, the following information should be sent to the Federal Awards Manager.

1. Any change of call sign by W.I.A. award holders.
2. Any change of address by W.I.A. award holders.

Many holders of awards have changed from Limited licences to Full licences and it is often difficult to trace the new call sign.

Any information given will be most appreciated.

"CQ" S.S.B. DX AWARD

In October 1969 "A.R." page 24 it was announced that "CQ" intended to withdrew their "CQ" S.S.B. DX AWARD. Due to continued interest in this award, "CQ" has decided to continue issuing the award for a further period of 12 months. If sufficient interest is shown in the award during this period it will be continued on a permanent basis.

Application forms for this award may be obtained by forwarding a s.a.s.e. (9 x 4 in.) to the Federal Awards Manager, W.I.A., P.O. Box 67, East Melbourne, Vic., 3002.

—Geoff Wilson, VK3AMK,
Federal Awards Manager.

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- Improving their general knowledge in modern electronic techniques and disciplines, and
- Providing more specialised training in one of the main fields of applied electronics.

It includes free travel, accommodation and study programmes, plus out-of-pocket expenses, free medical schemes, etc., and offers students the opportunity to obtain the degree of Master of Electronic Engineering at the completion of the year's course.

The scheme is operated by Philips Institute of Technological Studies, which was set up in 1957 by the international Philips electronics organisation, based at Eindhoven, the Netherlands.

The P.I.I. scheme, which is intended for non-employees of Philips throughout the world, is designed to provide young (under 30) graduates with one year of post-graduate study in the various branches of science and technology which come within the ambit of Philips' activities.

Students accepted in the P.I.I., which is located at Philips' world headquarters in Eindhoven, undertake private theoretical and experimental studies within the Institute, attend lectures by experts from the Company's research and factory laboratories, and are offered the opportunity to obtain practical experience in these laboratories.

The programme of studies is individual and every effort is made to keep lectures and practical work periods in accordance with each student's own preferences.

The number of places for each year's P.I.I. course is purposely kept low (30 in total) in order to guarantee good personal contact between staff and students, and the academic standards of applicants for the course must consequently be high.

The 1970-71 course, which commences in the last week in September 1970 will specialise in control and industrial electronics. In 1971-72 and 1972-73 the main subjects will be chosen from communication techniques and digital techniques respectively.

Full details on the Philips International Institute and application forms for the 1970-71 course are obtainable from the P.I.I's representative in Australia, Mr. H. J. Brown, Technical Director, Philips Industries Ltd., 69-79 Clarence Street, Sydney, N.S.W., 2000.

Interested persons are requested to contact Mr. Brown as soon as possible because all applications for this course must be received by the Institute in Eindhoven before May 31, 1970.

HISTORY OF A.R. AND W.I.A.

(continued from page 24)

veloped in a conflagration without parallel in human history. Here was the opportunity for those who had become skilled in the new marvel of communications to put their skill to practical use in the national interest. How they did this in World War I., the problems which faced the hobby of Amateur Radio after the conclusion of hostilities, how these were overcome and how Amateur Radio really flourished will be continued in the next article.

(to be continued)

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